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Prospective Payment for CHAMPUS Exempt Services

An Analysis of Children's Hospitals, Substance Abuse Services, and Psychiatric Services

Jack Zwanziger, Elizabeth M. Sloss,
Susan D. Hosek, Anil Bamezai,
Lois M. Davis, Kirk Cameron

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PREFACE

In October 1987, the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) implemented a prospective payment system for covered hospital services, based on diagnosis-related groups (DRGs). CHAMPUS exempted several categories of hospital services from its DRG payment system, including children's hospitals, substance-abuse services, and psychiatric services. This report presents the results of a study of selected alternatives for extending prospective payment to these services. The study also included an analysis of payment for neonatal services, the results of which will be published in a separate report. The results should be of interest to those conducting research or making policy decisions related to prospective payment systems. The research was initiated in 1987 and was completed in 1989.

The research was sponsored by the Assistant Secretary of Defense (Health Affairs). It was conducted under the auspices of the National Defense Research Institute (NDRI), RAND's federally funded research and development center sponsored by the Office of the Secretary of Defense and the Joint Staff. NDRI's Defense Manpower Research Center conducted the research in cooperation with RAND's Health Sciences Program.

SUMMARY

In an effort to control rapidly increasing costs, the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) adopted a prospective payment system for inpatient services in October 1987. The new payment system, like the system Medicare has used since 1983, pays a predetermined amount for a hospital admission depending upon which diagnosis-related group (DRG) it falls into. This report presents an analysis of payment options for three types of services CHAMPUS initially exempted from its prospective payment system: children's hospitals, substance-abuse services, and psychiatric services. CHAMPUS exempted these services because of concerns that including them in its prospective payment system would lead to large decreases in revenues for hospitals with justifiably higher costs.

For each of these three exempt services, we provided initial information on the CHAMPUS workload, including case mix, distribution across specialty and nonspecialty hospitals, and the ability of existing DRG systems to differentiate among patients who use different levels of resources. Based on this and other information, the Office of the Assistant Secretary of Defense for Health Affairs—OASD(HA)—asked us to evaluate one or more alternative payment systems. Congressional direction to OASD(HA) imposed additional constraints on some of the payment systems we considered. For each system, we estimated payment parameters and simulated the impact on individual hospital revenues, assuming no changes in utilization.

In conducting the analyses, we used data from several sources. For services in children's hospitals and mental health (psychiatric and substance abuse) services in nonexempt facilities, information on CHAMPUS discharges was derived from claims processed between July 1, 1986, and June 30, 1987. CHAMPUS used records from this same period as the basis for its prospective payment system for all other nonexempt services. The analysis of mental health services provided in exempt facilities was based on claims processed between July 1, 1987, and May 31, 1988, inflated slightly to fiscal year (FY) 1988 levels. Information on the hospitals providing these services was obtained from the 1985 and 1986 (unaudited) Medicare Cost Reports and from the American Hospital Association.

In designing the payment system for these services, it was important to recognize two major differences between the CHAMPUS and Medicare populations. First, the population of CHAMPUS beneficiaries is younger than the Medicare population. CHAMPUS finances health care for the dependents of active-duty personnel, as well as for retired military personnel and their dependents. CHAMPUS eligibility ends at age 65, when Medicare eligibility begins. Second, CHAMPUS beneficiaries have access to other sources of care. These beneficiaries are eligible to receive care in military hospitals and clinics, subject to availability, as well as within the civilian health-care system covered by CHAMPUS. Because of these two differences, the mix of services provided under CHAMPUS differs substantially from the mix provided under Medicare.

SERVICES PROVIDED IN CHILDREN'S HOSPITALS

Pediatric patients in nonexempt hospitals were covered by the CHAMPUS prospective payment system implemented in October 1987. However, children's hospitals were exempted because preliminary analysis showed that these hospitals would suffer large revenue losses if they were reimbursed under the new system.[1] Our analysis showed that CHAMPUS pediatric patients in children's hospitals, compared with pediatric patients in nonexempt hospitals, fall disproportionately into DRGs with higher average resource use. Even after adjusting for differences in the mix of DRGs, the average total charges for patients in children's hospitals were 34 percent higher than for pediatric patients in other, nonexempt hospitals.

In an attempt to improve the usefulness of DRGs in distinguishing among pediatric patients requiring different levels of resources, the National Association of Children's Hospitals and Related Institutions and others developed a pediatric-modified DRG (PM-DRG) classification system. We compared the ability of the original DRG system and the revised PM-DRG system to explain the resources used by CHAMPUS patients (using charges to measure resource use). The PM-DRGs explain slightly more of the variance in charges than the original DRGs do, but the difference is small (R^2 of 0.279 and 0.254, respectively).

These results led OASD(HA) to develop a DRG payment system for children's hospitals that would use the original DRGs (as opposed to

[1]Neonatal services in all hospitals also are exempt; these are being studied separately and *are not included in any analyses described in this report.*

PM-DRGs), but also to set a higher level of reimbursement. The "children's hospital differential" would be equivalent in the base year to estimating a separate standardized amount for children's hospitals, set at a level to maintain "revenue neutrality."[2]

In addition to having higher average charges per discharge, an unusually large proportion of charges in children's hospitals is for cases defined as cost outliers (for FY 1987, 9.3 percent for children's hospitals versus 4.0 percent for nonexempt hospitals). To protect those children's hospitals with more than their share of these costly patients, OASD(HA) also elected to consider adopting a different outlier policy for these hospitals. A combination of the FY 1988 and FY 1989 policies would yield the most generous policy. The combined outlier policy (as we refer to it) would retain the lower threshold (in effect prior to FY 1989) for identifying cost outliers, but would use the new policy's higher additional payments for these outlier cases.

The DRG payment systems that we evaluated for children's hospitals were designed to be revenue neutral in the 1986–1987 base year. As mandated by Congress, the final program was revenue neutral in FY 1988. Under revenue neutrality, our simulated DRG-based payments in the base year for children's hospitals as a group are equal to the actual payments made, by definition. This is equivalent to saying that the proposed payment system for children's hospitals would have no fiscal impact in the base year. However, the estimated impact differs for certain subgroups of children's hospitals. We estimate that the 14 hospitals with fewer than 25 CHAMPUS discharges in the 12-month base period would have averaged substantially more than their actual charges, whereas the nine hospitals with 25 or more discharges would have averaged about the same or slightly less. Of the alternatives considered, the combined outlier policy (described above) would minimize the largest loss suffered by any individual hospital. These results compare favorably with the impact on revenues for pediatric patients in nonexempt hospitals, which we projected would have declined 26.6 percent in the base year—similar to the revenue decreases projected for adult patients.

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[2]Revenue neutrality means that estimated payments under a DRG-based prospective payment system in the base year would be equal to actual payments made under the billed-charges system.

DRG REIMBURSEMENT FOR SUBSTANCE-ABUSE AND PSYCHIATRIC SERVICES

Prospective payment for psychiatric services has been the subject of study for several years, but a review of the literature uncovered no generally accepted method for per-case reimbursement. Neither DRGs nor other classification schemes explain more than a small proportion of the variation in resource use, as measured by costs, charges, or length of stay. As a result, hospitals were subject to poorly understood risks of losses in revenue.

In the absence of an acceptable alternative, OASD(HA) decided to follow Medicare's lead and include psychiatric services *provided outside of specialty hospitals or units* in its DRG payment system. These hospitals provide a wide range of services and can offset losses for one patient with gains for others. For psychiatric and substance-abuse services provided by psychiatric hospitals and distinct psychiatric units of general hospitals, OASD(HA) asked us to investigate a per-diem payment system. By not putting the hospital at risk for variations in length of stay, per-diem payments avoid the potential for large revenue losses. At the same time, they give CHAMPUS control over the amount reimbursed per inpatient day.

In October 1987, Medicare included substance-abuse services in its prospective payment system for inpatient services, using a new set of substance-abuse DRGs. We compared the distribution of CHAMPUS substance-abuse cases among the original and the newly reconfigured DRGs and found very little difference. Only one-quarter of the 2814 cases studied were reclassified by the new DRG system; under both systems, over 60 percent fall into a single DRG.

CHAMPUS substance-abuse discharges are concentrated in relatively few hospitals. Of the 788 hospitals represented by claims in the base period, 630 had fewer than five discharges and only 12 hospitals had 25 or more discharges. These figures exclude substance-abuse cases treated in exempt psychiatric hospitals or hospital units; these cases were included in the analysis of per-diem reimbursement for psychiatric services.

The average charges for CHAMPUS substance-abuse cases differed across DRGs, with the two DRGs for patients receiving rehabilitation averaging 26 percent more than the other DRGs. These two DRGs (DRGs 436 and 437) accounted for only 18 percent of the total discharges.

The original substance-abuse DRGs were developed from data on the Medicare population. To explore their appropriateness for a younger population, we investigated the relationship between charges and age within DRG 435, the substance-abuse DRG with the most cases.[3] In this DRG, the charges for patients under the age of 21 were 24 percent higher than the charges for patients 21 and over, reflecting a longer average length of stay.

Average charges per case also differed by hospital type. After adjusting for the mix of patients by DRG and age, as well as location in urban or rural areas, hospitals known or thought to specialize in alcohol- and drug-abuse treatment[4] had significantly higher charges. As a group, these hospitals had the highest average charges and an unusually large fraction of long-stay outliers.

After reviewing these findings, OASD(HA) asked us to investigate the financial impact of including substance-abuse cases in its DRG system, using the new DRGs with DRG 435 split at age 21. We found that, as a group, these cases would have been reimbursed 64 percent of their actual charges in the 1986–1987 base year, before passthroughs; this level is identical to the overall average for other services receiving DRG payments. The impact of this revenue loss is negligible for most hospitals, since CHAMPUS accounts for only 0.3 percent of the average hospital's patient days. However, the impact differs substantially across hospitals. The 12 hospitals with 25 or more discharges were reimbursed a lower proportion of their billed charges than the 689 hospitals with 10 or fewer discharges. Hospitals known or thought to be specialty hospitals were reimbursed the least, averaging just over one-half of their actual revenues under the DRG system. General hospitals, in contrast, would be reimbursed, on average, at a higher level for their substance-abuse patients than for their other patients.

One possible explanation for the higher charges and larger projected revenue losses for specialty hospitals is undercoding of rehabilitation therapy on the claim. If these hospitals are providing rehabilitation therapy to more patients than is reflected in the claims for the base period, the change to DRG payments will offer an incentive for coding rehabilitation, leading to larger-than-projected payments. However,

[3]DRG 435 is defined as alcohol/drug abuse or dependence with detoxification or other symptomatic treatment, without complications or comorbidities.

[4]We were unable to obtain data on a number of these hospitals from Medicare or American Hospital Association data files. Calls placed to a sample of these hospitals showed that most specialize in alcohol- and drug-abuse treatment.

if the longer lengths of stay in specialty hospitals result from other differences, some specialty hospitals may face substantial cuts in their CHAMPUS revenues and could respond by treating fewer CHAMPUS patients or cutting back on services. For these reasons, we believe that CHAMPUS should monitor actual experience as substance-abuse services are brought into the CHAMPUS DRG payment system.

DRG REIMBURSEMENT FOR PSYCHIATRIC SERVICES

Three-quarters of the CHAMPUS psychiatric patients to be included in the DRG system are treated in general acute-care hospitals without major teaching programs; most of the remainder are in hospitals about which we had no information. As with substance-abuse services, most of the hospitals with claims had only a few CHAMPUS discharges, whereas only 10 percent of the hospitals accounted for about one-half of the discharges.

Similar to substance-abuse cases, a single psychiatric DRG contained one-half of the cases, and outliers play an important role in determining the average charges within a DRG. In addition, the ratio of charges for psychiatric discharges to the charges for all other types of CHAMPUS discharges is higher than for Medicare.

If nonexempt hospitals had been reimbursed through CHAMPUS prospective payment in the base period (1986–1987), they would have received 72 percent of their billed charges for psychiatric discharges. This level of impact is equal to the estimated impact for nonexempt services included in the prospective payment system when "pass-through" payments for capital and costs of medical education are included. Hospitals with a low volume of CHAMPUS psychiatric cases would fare better than higher-volume hospitals. In the base year, 293 of the 987—including 15 of the 29 hospitals with 25 or more CHAMPUS psychiatric discharges—would have received 72 percent or less of their actual charges under DRGs.

PER-DIEM REIMBURSEMENT FOR SUBSTANCE-ABUSE AND PSYCHIATRIC SERVICES IN EXEMPT FACILITIES

CHAMPUS psychiatric discharges from exempt psychiatric hospitals and units were to be reimbursed under a per-diem payment system. Most of these discharges were concentrated in a few, mostly nonteaching, hospitals. To minimize the risk of large revenue losses,

OASD(HA) decided to use hospital-specific per-diem rates for hospitals with more than 25 patients discharged between July 1, 1987, and June 30, 1988. The remaining hospitals would be paid per-diem rates based on the average charges in their region. The hospital-specific and regional per-diem rates do not depend on the patient's DRG or age, because the charges per day of psychiatric stays are not affected by these factors (although lengths of stay did vary by age and DRG). The decision to use regional rates was based on our finding that average charges per day for patients in the low-volume hospitals varied by region (from $336 to $478), but did not differ between urban and rural locations.

To set the structure for regional rates, we investigated the relationship between average charges per day and length of stay. We found the average daily charge falls rapidly after the first day, begins to flatten out after five days, and becomes relatively constant beyond 12 days. These results are consistent with the notion that the first day or days of a psychiatric stay are more expensive and that daily costs, thereafter, are lower and relatively constant.

We simulated the financial impact of a per-diem system paying hospital-specific rates to providers with 25 or more discharges (high-volume) and regional rates to low-volume providers (<25 discharges). The system was designed to be revenue neutral in FY 1988, and the hospital-specific rates were capped at the 80th percentile of the per-day charges for all discharges from high-volume providers ($629). We simulated two regional per-diem systems: (1) a flat per-diem system, which pays the same amount for each inpatient day, the amount depending upon the region, and (2) a two-part per-diem system, which pays the same amount for the first day of each stay *regardless* of region, and a lesser amount for each subsequent day, *depending* upon the region.

In the FY 1988 base year, fewer hospitals would have been reimbursed less than their billed charges under the two-part per-diem system; however, even under the flat per-diem system, only 11 percent of the hospitals would have been paid 72 percent or less of their charges. The impact of the hospital-specific system is more difficult to estimate since, by definition, per-diem revenues in the base period equal actual revenues for these hospitals, unless their rates are capped at the 80th percentile. Of the 116 hospitals with sufficient volume for a hospital-specific rate, only five would have had their rates capped below 72 percent of their actual average charges per day.

OASD(HA) has elected to implement a flat per-diem system for CHAMPUS psychiatric discharges, with regional rates for low-volume providers and hospital-specific rates for high-volume providers. Our findings suggest that the average cost of the first day of a psychiatric admission exceeds the average costs of eacl subsequent day. Therefore, a flat per-diem system will tend to overpay hospitals for each day of care beyond the first, providing an incentive to lengthen stays. In addition, the regional rate or the hospital-specific rate used to reimburse a particular hospital may differ from the actual charges per day at that hospital. The hospital-specific rate would differ if the base-year cases used to calculate this rate were not representative of the hospital's normal mix of patients. For these reasons, per-diem payment for psychiatric services could lead some hospitals to encourage or discourage CHAMPUS admissions, or to alter their lengths of stay. We recommend that CHAMPUS monitor the impact of the per-diem system to guard against increasing program costs or other undesirable outcomes.

INCORPORATION OF EXEMPT SERVICES IN THE CHAMPUS PROSPECTIVE PAYMENT SYSTEM

By March 1989, all of the exempt services discussed in this report had been incorporated into the CHAMPUS prospective payment system. The research described here, initiated in 1987 and completed in 1989, supported the development of these changes. In October 1988, CHAMPUS began using a modified version of DRGs as the basis for reimbursing for CHAMPUS substance-abuse and psychiatric services in nonexempt hospitals and units. In January 1989, CHAMPUS began using a per-diem payment system to reimburse for CHAMPUS substance-abuse and psychiatric services in exempt psychiatric hospitals and exempt psychiatric units within hospitals. In March 1989, CHAMPUS began reimbursing children's hospitals for CHAMPUS patients using existing DRGs, but based on a higher standardized amount (called "the children's hospital differential") and a more generous outlier policy than reimbursements to nonexempt hospitals.

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We would also like to acknowledge the help of several others. Richard Barnett of the Office for the Civilian Health and Medical Program of the Uniformed Services (OCHAMPUS) and Peter McCanna of Lewin/ICF, Inc., furnished us with many of the data files used to conduct the research, along with advice and documentation necessary for their proper use and interpretation. Stephen Isaacson and Stanley Regensberg of OCHAMPUS supplied us with an abundance of useful information in answer to our questions about the CHAMPUS system. Discussions with John Muldoon of NACHRI provided us with valuable insights into pediatric inpatient care and children's hospitals.

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1. INTRODUCTION

In October 1987, the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS) introduced a prospective payment system (PPS) for inpatient care based on diagnosis-related groups (DRGs). The CHAMPUS PPS, which resembles that adopted by Medicare in 1983, is aimed at controlling the rapid rise in inpatient costs. CHAMPUS had previously paid billed charges, which were substantially higher than the cost-based payments made by Medicare. This report presents an analysis of payment options for three types of services CHAMPUS initially exempted from its prospective payment system: children's hospitals, substance-abuse services, and psychiatric services. CHAMPUS exempted these services because of concerns that including them in its PPS would lead to large decreases in revenues for hospitals with justifiably higher costs or longer lengths of stay.

For each of these three exempt services, we provided initial information on the CHAMPUS workload, including case mix, distribution across specialty and nonspecialty hospitals, and the ability of existing DRG systems to differentiate among patients who use different levels of resources. Based on this and other information, the Office of the Assistant Secretary of Defense for Health Affairs—OASD(HA)—asked us to evaluate one or more alternative payment systems. Congressional direction to OASD(HA) imposed additional constraints on some of the payment systems we considered. For each system, we estimated payment parameters and simulated the impact on individual hospital revenues.

SERVICES COVERED BY CHAMPUS

CHAMPUS finances a wide range of health-care services for the dependents of active-duty personnel, as well as for retired military personnel and their dependents. CHAMPUS eligibility automatically ends with eligibility for Medicare at age 65. Therefore, the CHAMPUS population is considerably younger than the Medicare population. In addition, because active-duty personnel are not covered, the CHAMPUS population includes few adult males under age 40. Not surprisingly, obstetric, gynecologic, and pediatric care account for a high proportion of CHAMPUS outlays.

Another important factor determining the mix of services provided under CHAMPUS is the availability of care in military hospitals and clinics. Military facilities provide care, first, for active-duty personnel and then, as space permits, for other beneficiaries. Dependents of active-duty personnel have priority over retirees and their dependents. When inpatient care can be provided in a nearby military hospital (within 40 miles), CHAMPUS will not pay for civilian inpatient care. Beneficiaries are free to use either the military or civilian system for outpatient care, but the CHAMPUS $50 deductible and 20–25 percent copayment cause many beneficiaries to prefer military clinics, which are free.[1] Substance-abuse and psychiatric services account for an unusually large share of CHAMPUS outlays because these services (both inpatient and outpatient) are rarely available in military facilities to beneficiaries not on active duty.

DRG-BASED PROSPECTIVE PAYMENT SYSTEM FOR CHAMPUS INPATIENT SERVICES

The classification system used by CHAMPUS and Medicare at the time this research was conducted (1988) is based on 475 DRGs. These groups are defined by diagnosis and procedure codes, presence of comorbidities and complications, and age. A DRG's relative weight represents the ratio of the average charge of a discharge assigned to that DRG to the average charge of all discharges.[2] CHAMPUS measures relative costs by applying the average cost-to-charge ratio measured for Medicare patients to the charges from every hospital.

The CHAMPUS DRG system, like Medicare's, pays a prospectively determined fixed amount for each hospital stay. This payment is equal to the DRG's relative weight, or relative payment level, times a standardized payment amount. Table 1 compares the CHAMPUS system with the Medicare system upon which it was based. The CHAMPUS standardized amount reflects the average costs of a hospital stay and differs for urban and rural hospitals, but not by region. Beginning with Fiscal Year (FY) 1989, different amounts were calculated for large urban areas, other urban areas, and rural areas. The payment is also adjusted by the Medicare area wage index and the indirect costs of medical education. Capital costs and direct medical education costs are separately reimbursed in an annual payment to each hospital.

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[1]The CHAMPUS deductible increased to $150 in 1991.

[2]All charges are standardized for the indirect costs of teaching and local wage rates.

Table 1

Comparison of CHAMPUS and Medicare Prospective Payment Systems (as of FY 1988)

	CHAMPUS	Medicare
Services exempt from prospective payment		
Children's hospitals	Yes	Yes
Other pediatric	No	No
Neonatal	Yes	No
Substance abuse	Yes	No[a]
Psychiatric hospitals	Yes	Yes
Psychiatric units in general hospitals[b]	Yes	No
Payment adjustments		
Wage index	Yes	Yes
Urban vs. rural	Yes	Yes
Region of country	No	No[c]
Teaching level	Yes	Yes
Outlier payments		
Short-stay	Yes	No
Long-stay	Yes	Yes
High-cost	Yes	Yes
Annual payment for capital costs	Yes	Yes

[a]As of October 1987.

[b]In FY 1988, all psychiatric units in general hospitals were classified as exempt from the CHAMPUS prospective payment system. However, not all of these psychiatric units were classified as exempt from the Medicare prospective payment system.

[c]As of April 1988.

In introducing prospective payment, CHAMPUS cut its average expected payment level by approximately 28 percent. The standardized amount is calculated such that the per-case payments average 64 percent of the billed charges in a base year. After adding in capital and medical education payments, the average hospital receives 72 percent of billed charges in the base year. The standardized amount is then increased each year by the same factor that Medicare uses.

Unusually long or expensive stays receive additional "outlier payments." These payments, again modeled on the Medicare system,

minimize hospital losses for cases with lengths of stay or charges exceeding cutoffs set for each DRG.

CHAMPUS initially exempted several types of services and providers from its DRG payment system. As did the Medicare system, CHAMPUS exempted services provided in children's hospitals. In addition, CHAMPUS exempted all inpatient substance-abuse and psychiatric services, a more extensive exemption than for Medicare, which had only exempted these services when provided by distinct units or specialty hospitals. The exemptions were granted because of concerns that the existing DRGs might not accurately represent resource use for these three services.

OUTLINE OF THE REPORT

This report presents the results of an analysis of prospective payment options for three services exempt from the CHAMPUS DRG payment system.[3] Although specific issues differ for children's hospitals, substance-abuse services, and psychiatric services, we addressed similar broad questions in each area:

1. What are the characteristics of the use of these services under CHAMPUS?
2. What alternative payment systems would CHAMPUS consider for implementation?
3. How well do these payment options capture differences in resource use across patients and hospitals?
4. Are modifications of previous methods necessary because of the unique characteristics of the CHAMPUS population?
5. What would the impact of a DRG system be on hospitals' CHAMPUS revenues, especially for hospitals with high CHAMPUS volumes?

The data sources and methods used in analyzing each type of exempt service are described in Sec. 2. The analytic details and findings for children's hospitals, substance-abuse services and psychiatric services in *nonexempt* facilities, and for substance-abuse and psychiatric

[3]CHAMPUS also exempted several other services, including care for neonates (babies less than 29 days old) and children with cystic fibrosis, bone-marrow transplants, and Acquired Immune Deficiency Syndrome. Neonatal services were subsequently incorporated into the CHAMPUS DRG prospective payment system. The other services are expected to be exempted indefinitely because a PPS would be difficult to develop and because they represent a very small proportion of CHAMPUS claims.

services in *exempt* facilities are presented in Secs. 3, 4, 5, and 6. Section 7 summarizes the implications of this research.

This research was conducted in accordance with policies established by both the Office of the Assistant Secretary of Defense for Health Affairs and the Congress, which limited the range of options we could consider. Throughout the report, we indicate the nature and source of those policies.

2. DATA AND METHODS

The data for these analyses include CHAMPUS inpatient claims, records, and information on hospitals from the Medicare Cost Report files and the American Hospital Association (AHA) 1986 Annual Survey of Hospitals. The files were initially prepared by ICF Incorporated (now Lewin/ICF), to conduct their original analyses of DRG payments for nonexempt services (ICF Incorporated, 1987).

CHAMPUS CLAIMS DATA

The analyses for childrens' hospitals, and of the substance-abuse and psychiatric discharges that were not from Medicare-exempt hospitals,[1] were based on 1986–1987 claims. Lewin/ICF derived this file from the CHAMPUS UB-82 Supplemental Data Claims File containing records of hospital stays with claims processed between January 1, 1986, and June 30, 1987. Lewin/ICF used a subset of these claims, between July 1, 1986, and June 30, 1987, to develop the original CHAMPUS DRG system.[2] However, for psychiatric cases in Medicare-exempt psychiatric hospitals and units, we used a more recent file based on claims processed between July 1, 1987, and May 31, 1988. We used this 1987–1988 file for the analysis of psychiatric services in Medicare-exempt psychiatric facilities because the 1986–1987 file was missing some records. Although the incomplete file was an unbiased subset of 1986–1987 records, the per-diem system required that a complete count of CHAMPUS discharges be available for all exempt psychiatric facilities in FY 1988.

The original 1986–1987 analysis file included 214,414 records. After Lewin/ICF excluded records with bad or missing data or for other

[1]We use the term Medicare-exempt to refer to hospitals or units exempt from the Medicare prospective payment system under October 1983 rules.

[2]Some of CHAMPUS' fiscal intermediaries were unable to retrieve a complete record of their claims, so some states were underrepresented. To check for bias, we corrected for differences in the distribution over states and in case mix, and recalculated the average standardized amounts. The two average standardized amounts were essentially identical.

exempt services,[3] the file contained 192,694 records. Specific reasons for excluding records included the following:[4]

- The record was an interim bill and did not include the full charge for the stay, or it was an exact duplicate of another record.
- The discharge date was before the admission date.
- The length of stay was more than 365 days.
- Dependent status or charge data were missing (or zero).[5]

For children's hospitals, we analyzed records for the 12 months between July 1, 1986, and June 30, 1987, to calculate the DRG system parameters—DRG weights, outlier thresholds, and average standardized amounts. We based the relative weights for psychiatric and substance-abuse DRGs on records for the 18 months between January 1, 1986, and June 30, 1987. The rest of the psychiatric and substance-abuse DRG analysis was based on records for the 12 months between July 1, 1986, and June 30, 1987. For the reasons outlined above, we analyzed records for the more recent 11 months between July 1, 1987, and May 31, 1988, for psychiatric and substance-abuse services provided in exempt psychiatric facilities. Table 2 shows the number of records for each type of exempt service and for all nonexempt services used in our analyses. These figures exclude neonatal and other exempt pediatric cases. The substance-abuse and psychiatric records are broken into two groups: (1) records used to analyze DRG-based payments to general hospitals and other hospitals not currently exempted by Medicare as psychiatric facilities and (2) records used to analyze the per-diem payment system for exempt psychiatric hospitals and exempt psychiatric units of general hospitals.

The 4142 records for children's hospitals were identified using a list of 57 CHAMPUS-exempt hospitals provided by the Office for CHAMPUS (OCHAMPUS). The 57 children's hospitals that have requested and were granted a CHAMPUS exemption are less than

[3]Neonatal care (patients less than 29 days old); pediatric patients (under age 18) with cystic fibrosis or who are HIV seropositive or had bone-marrow transplants; rehabilitation, long-term care, and cancer facilities; facilities in Maryland and New Jersey; sole community providers.

[4]Wherever possible, to maintain consistency, we used the same criteria for exclusion as Lewin/ICF.

[5]Records with missing Metropolitan Statistical Area (MSA) information were included in the calculation of the DRG system parameters assigning the mean for the value of the wage index. These records, however, were excluded from the impact analyses—and the descriptive analyses leading up to them—because the mean value assignment could distort the results substantially.

Table 2

Number of CHAMPUS Discharges Included in Analysis, by Payment System

Type of Payment System	Number of CHAMPUS Discharges
DRG payment for children's hospitals	
Pediatric services in children's hospitals[a]	4,142
Pediatric services in nonexempt hospitals[a]	25,902
DRG payment for substance-abuse and psychiatric services not in psychiatric hospitals/units	
Substance-abuse services[a]	2,814
Psychiatric services[a]	4,381
Per-diem payment for substance-abuse and psychiatric services in psychiatric hospitals/units	
Substance-abuse services[b]	1,946
Psychiatric services[b]	8,020

[a]July 1, 1986, through June 30, 1987.
[b]July 1, 1987, through May 31, 1988.

half of all children's hospitals in the United States—in the 1984 American Hospital Association Annual Survey of Hospitals, 135 hospitals identified themselves as some kind of children's facility. In 12 months of data, six of these 57 children's hospitals had no claims. Two hospitals were excluded from the analysis, because their claims were not available for processing.

The substance-abuse and psychiatric records were identified using the DRG classification system. All records classified in DRGs 433 through 437 under either the 1987 or 1988 grouper were considered substance-abuse cases. All admissions in DRGs 424 through 432 were considered psychiatric cases. The payment system we investigated for psychiatric services provided in exempt psychiatric hospitals or exempt psychiatric units is based on per-diem reimbursement. To avoid imposing two different payment systems on the same CHAMPUS providers, substance-abuse services provided in these exempt psychiatric facilities were to be included under the per-diem system and so were analyzed in combination with psychiatric services.

For all types of hospital records, we excluded charges for services not covered by CHAMPUS. The charge data for the 12 months from July

1986 through June 1987 were left in actual dollars. We adjusted the charges from January 1986 through June 1986 by a 9-month inflation rate of 5.25 percent to insert these charges symmetrically in the 12-month base period. The charges for the 11 months from July 1987 through May 1988 used in the per-diem calculations for the exempt psychiatric facilities were inflated by a 3-month inflation rate of 1.1 percent to represent the levels for the 12 months from October 1987 through September 1988.[6]

HOSPITAL DATA

CHAMPUS DRG payments are based on a number of hospital characteristics: number of beds, number of residents and interns, and location (includes zip code, which determines the wage index, and whether the locality is rural, large urban, or other urban). In addition, for these analyses, we needed to be able to identify the alcohol/drug hospitals and those hospitals that are exempt from the Medicare PPS (children's hospitals, and psychiatric hospitals or units). The provider file we received from Lewin/ICF included hospital names and addresses as well as CHAMPUS, Medicare, and AHA provider numbers, if available. It also included information on hospital size, ownership, location, and teaching status, largely derived from the 1985 Medicare Cost Report files.

In addition to the DRG payments for individual patients, CHAMPUS reimburses annually for capital and direct medical education costs, based on cost reports submitted by the hospitals. Data on capital and direct medical education costs were included in the Lewin/ICF provider file for a large proportion of providers, with the original information coming from the 1985 Medicare Cost Report. The records from the hospitals that did not have this information were included in calculating DRG weights and standardized amounts or per diems for psychiatric units and hospitals. The impact of the reimbursement system on these hospitals' revenues was estimated for these hospitals by assuming the annual payments to be zero or by excluding them from the impact analysis.

Unfortunately, not all of the specialty hospitals had complete information in the Lewin/ICF file. Many alcohol/drug hospitals and psychiatric hospitals and most children's hospitals did not have Medicare and/or AHA provider numbers, because they do not participate in Medicare or because the data were incomplete. In addition, the

[6]The inflation rate for the quarter was estimated as one quarter of the annual adjustment in the Medicare PPS standardized amounts between FY 1987 and FY 1988.

frequency with which Medicare identification numbers change makes it difficult to match claims and provider data records from two different time periods. Where possible, we obtained information from other sources.

The 1985 Medicare Cost Report Data listed the psychiatric hospitals and general hospitals with psychiatric units that are currently exempt from Medicare's PPS. We also received a more complete list of Medicare-exempt psychiatric facilities from the Health Care Financing Administration (HCFA). Despite these other sources, we were unable to obtain complete information for all of the hospitals in our data set. For hospitals CHAMPUS will reimburse through the DRG system, records are analyzed separately in the sections on substance-abuse and psychiatric services (183 of the 788 hospitals with CHAMPUS substance-abuse patients and 248 of the 1091 hospitals with psychiatric patients). The hospitals that OASD(HA) was considering paying through the per-diem system for these two services were identified by the staff of OASD(HA) from a list of exempt hospitals generated by HCFA as either a general hospital containing a Medicare-exempt psychiatric unit or a Medicare-exempt psychiatric hospital.

We used a different source of provider information for children's hospitals. The Lewin/ICF provider file contained little information on number of beds and residents for most of the children's hospitals and no information on their capital and medical expenses. Instead, we obtained data on these providers from the only available source, the 1986 American Hospital Association Annual Survey of Hospitals. However, the cost information in this file has not been audited and may, therefore, be less than accurate.

METHODS USED IN DRG CALCULATIONS

We used the same methods in extending the DRG system to the previously exempt services as Lewin/ICF had used in developing the 1987 CHAMPUS DRG payment system. To ascertain that we were using the same methods as Lewin/ICF, we replicated the average standardized amounts, DRG weights, and outlier thresholds that they had calculated for nonexempt services. We then recalculated the new parameters for a DRG payment system that included children's hospital, substance-abuse, and psychiatric cases. To generate the final set of results, we modified the Lewin/ICF methods to reflect several significant changes in the CHAMPUS DRG payment rules for FY

1989.[7] The results reported here incorporate all but one of these changes, as described below.

The DRG calculations involved two iterations: The first determines the DRG weights, outlier thresholds, and estimated standardized amounts, and the second determines the final standardized amounts. To calculate the DRG weights, we divided DRG-specific average standardized charge by the overall average standardized charge. The charges were standardized by multiplying by a predetermined cost-to-charge ratio and were adjusted for differences in the area wage index and indirect medical education costs. Again, following the FY 1989 rules, we used a cost-to-charge ratio of 0.64 and the following indirect medical education adjustment factor (proposed for FY 1989) where the teaching index equals the number of residents per bed:

$$1.43 \times [1.0 + \text{teaching index})^{0.5796} - 1.0].$$

Probably the most significant proposed change for the FY 1989 CHAMPUS PPS concerned outliers. Under this proposal, the three types of outliers were defined as follows:

1. *Short-stay outliers* are cases with a length of stay more than 1.94 standard deviations below the mean of the log length of stay (rounded down to the nearest whole number), with a minimum of one day.
2. *Long-stay outliers* are cases with a length of stay more than three standard deviations or 24 days (whichever is lower) above the geometric mean for the DRG.
3. *Cost outliers* are cases with standardized charges more than two times the basic DRG payment (DRG weight times the appropriate standardized amount) or $27,000, whichever is greater.

Short-stay outliers are not recognized by the Medicare payment system. The CHAMPUS definitions for the other two outlier groups are identical to Medicare definitions for FY 1989.

The payment for cases not qualifying as outliers equals the DRG weight times the appropriate standardized amount. Different standardized amounts are calculated for large urban (population of 1,000,000 or more), other urban, and rural areas. Short-stay outliers receive twice the average daily rate for the appropriate DRG, where

[7]See *The Federal Register*, August 31, 1988, for the final CHAMPUS rule changes. The Medicare changes were published in *The Federal Register* (April 5, 1988, and May 27, 1988).

the average daily rate is equal to the basic DRG payment divided by the geometric mean length of stay. Long-stay outliers receive the basic DRG payment plus 60 percent of the average daily rate for each covered day beyond the threshold. Cost outliers receive the basic DRG payment plus

$$0.8 \times [\, 0.64 \times (\text{charges} - \text{threshold}) \times \text{area wage index} \times \text{teaching index}\,].$$

Cases that qualify both as long-stay and cost outliers receive whichever payment is higher.

For each type of area (large urban, other urban, rural), the standardized amount equals the average standardized charge per discharge, adjusted so that the payments for both nonoutlier and outlier cases equal 0.64 times the sum of the total charges billed for both patients in that type of area. Including the additional payments for capital and direct medical education, the DRG system is expected to pay an average of 72 percent of the charges billed in the base year.

As we describe in Sec. 3, we used a separate standardized amount for children's hospitals, calculated to maintain revenue neutrality for this group of hospitals (where total payments equal total charges in the base year). In addition, we were asked by OASD(HA) to investigate the impact of three outlier policies for children's hospitals: the policy described above and two alternative policies.

These DRG-based calculations were carried out on the complete file of exempt and nonexempt services, excluding psychiatric and substance-abuse cases in Medicare-exempt psychiatric facilities. The claims for this subset of cases were analyzed separately to evaluate a per-diem payment approach, instead of DRG-based reimbursement. The details of these calculations are contained in Sec. 6.

METHODS USED IN IMPACT ANALYSIS

One important measure of the effects of revising CHAMPUS payment methods is the impact on hospital revenues. For each type of service covered in this report, we estimated the payments each hospital would have received in the base period under one or more new payment methods, and compared those with the allowable charges that CHAMPUS actually paid. The amounts the hospitals would have gained or lost are based on 1986 dollars. The estimated payments to each hospital include the basic DRG payment for each nonoutlier

case, or the basic DRG payment and outlier payment for each outlier case, plus the annual payment for capital and direct medical education costs (when available).

For services originally included in the DRG payment system, the CHAMPUS PPS reimbursed an average of 72 percent of the charges billed in the 1986–1987 base year. The DRG-based payments for each case average 64 percent of charges; the additional 8 percent represents the annual payments for capital and medical education. The impacts we simulate for children's hospital, substance-abuse, and psychiatric services are differentially affected by the payment rules adopted for each service. OASD(HA) decided to reimburse substance-abuse and psychiatric services provided outside of exempt psychiatric facilities and pediatric services provided outside of children's hospitals through the basic DRG payment system. However, to increase acceptance by hospitals and by Congress, OASD(HA) chose to reimburse services provided by exempt children's hospitals and psychiatric facilities at a higher level. The per-diem rates for exempt psychiatric facilities were set at the levels necessary for revenue neutrality in FY 1988, the period covered by the UB-82 data we used. The DRG payments for children's hospitals were calculated to achieve revenue neutrality in FY 1987. Congress further stipulated revenue neutrality for FY 1989, the first year of the new payment system, to be achieved through end-of-year payment adjustments. For psychiatric and children's hospitals paid at hospital-specific rates, therefore, there is by definition no simulated impact. Among the low-volume facilities paid average rates, some will have simulated payments higher than revenues and others lower than revenues, but as a group, the payments will be revenue neutral. By definition, revenue neutrality means average payments equal average charges in this base year.

It is important to note that these impact estimates assume that there are no behavioral responses to the new incentives incorporated in the new payment methods.

3. DRG-BASED PAYMENT FOR CHAMPUS PATIENTS IN CHILDREN'S HOSPITALS

Since Medicare implemented its prospective payment system for inpatient care in 1983, many children's hospitals have been exempt from payment under the system; instead, Medicare has reimbursed children's hospitals according to billed charges. In designing its PPS, CHAMPUS found that pediatric cases in children's hospitals have significantly higher charges than the national average, after adjusting for differences in wages, teaching activity, and case mix (*Federal Register*, September 1, 1987). Therefore, when CHAMPUS adopted prospective payment for inpatients in October 1987, children's hospitals exempt under Medicare were also classified as exempt under the CHAMPUS system. Until children's hospitals are incorporated into the PPS, CHAMPUS will reimburse them for their billed charges.

CHARACTERISTICS OF CHILDREN'S HOSPITALS

Several characteristics of children's hospitals are important in evaluating their reimbursement status. First, pediatric patients in general may be more expensive than adult patients because hospitalized children may require more nursing care and other specialized services, such as feeding teams, play therapy, and tutors. This means costs will be higher in children's hospitals than in general hospitals. Second, children's hospitals treat more complex pediatric cases than other types of hospitals, even within the same DRG category (National Association of Children's Hospitals and Related Institutions [NACHRI], March 1985). This means that costs of pediatric patients in children's hospitals will be higher than costs of pediatric patients in other hospitals. Third, children's hospitals are tertiary care centers for pediatric patients, maintaining costly services on a standby basis (Restuccia and Payne, 1985). The costs of these services are averaged into the rate schedule of the hospital, thereby increasing the charges.

Because children's hospitals treat only pediatric patients, they are unable to shift costs from pediatric patients to the less costly adult patients, as other hospitals do (Restuccia and Payne, 1985). Therefore, children's hospitals are likely to be at higher risk under a PPS.

Options for reimbursing children's hospitals should address these differences between children's hospitals and others (Restuccia and Payne, 1985). Children's hospitals could be reimbursed using prospective payment based on a different DRG-type classification system, designed for pediatric diagnoses. Or, a PPS with hospital-specific reimbursement rates could be designed. Or, a system incorporating more generous outlier payments could be adopted for children's hospitals, in recognition of the longer stays and higher costs of many of their patients.

The analyses described in this chapter address several alternatives for incorporating children's hospitals into the CHAMPUS PPS. All data are based on claims for the 12 months between July 1, 1986, and June 30, 1987.

CHARACTERISTICS OF CHAMPUS SERVICES IN CHILDREN'S HOSPITALS

Children's hospitals account for a sizeable fraction of CHAMPUS pediatric inpatient care, but a much smaller fraction of all CHAMPUS inpatient care. About 14 percent of CHAMPUS pediatric inpatient claims (excluding neonates) were for care in children's hospitals. However, children's hospitals accounted for only about 2 percent of all CHAMPUS claims, patient days, and charges for this period.

A total of 6044 CHAMPUS claims was filed for patients in children's hospitals exempt under CHAMPUS prospective payment. We excluded 1902 of these claims from the analysis, including claims for 662 adults, 1011 neonates, and 88 substance-abuse and psychiatric patients.[1] We also excluded claims for 77 cystic fibrosis patients, because these cases will remain exempt from the PPS indefinitely.

Forty-nine exempt children's hospitals discharged 4,142 CHAMPUS pediatric patients (Table 3), and 3,225 nonexempt hospitals discharged a total of 25,902 CHAMPUS pediatric patients. These numbers represent most of the pediatric patients discharged from children's hospitals and other hospitals during this time period. However, the following subgroups were not included in the analyses reported in this section: patients 18 or over, patients under 29 days

[1]Reimbursements of children's hospitals, psychiatric DRGs, and substance-abuse DRGs were evaluated separately to allow a more focused look at each category of exempt discharge. Thus, psychiatric and substance-abuse DRGs were excluded from the analysis of patients in children's hospitals.

of age, DRGs related to pregnancy and childbirth (370–384), neonatal DRGs (385–391), psychiatric DRGs (424–432), substance-abuse DRGs (433–438), bone-marrow transplants, and cystic fibrosis.

More than half of the 49 children's hospitals are considered teaching hospitals, while less than a quarter of the nonexempt hospitals serving CHAMPUS pediatric patients are teaching hospitals (Table 3). A higher proportion of children's hospitals than of nonexempt hospitals treated a high volume of CHAMPUS pediatric patients. About 72 percent of children's hospitals discharged 25 or more CHAMPUS pediatric patients, while only 6 percent of the nonexempt hospitals did.

Case Mix Across Hospitals

Children's hospitals are thought to serve more complicated and severe pediatric cases than general hospitals. Because severity is difficult to measure, we compared the case mix of CHAMPUS pediatric patients in children's hospitals and those in nonexempt hospitals. Case mix is defined as the resource use of an average case in a particular hospital, based on systemwide DRG-specific averages of resource use. Case mix is calculated as the sum of the DRG relative weights for all cases in a particular hospital divided by the total number of cases in that hospital; it is simply the average relative weight. Because the relative weights are the same systemwide, case mix does not measure variation across hospitals in resource use within the same DRG.

On average, children's hospitals have a more costly mix of CHAMPUS pediatric patients than nonexempt hospitals (Table 4). Although the case mix is higher for all types of children's hospitals, the difference is most pronounced for the nonteaching hospitals. The case mix of nonteaching children's hospitals is 37 percent higher than other nonteaching hospitals. This evidence supports the findings of previous studies (NACHRI, March 1985) showing that children's hospitals treat a more costly set of pediatric patients than other hospitals.

Differences in Charges

CHAMPUS pediatric patients in children's hospitals stay longer and are considerably more expensive, on average, than pediatric patients in nonexempt hospitals (Table 5). The average length of stay is 16 percent longer, and the average daily standardized charge was 45

Table 3

Distribution of Hospitals and CHAMPUS Pediatric Discharges by Teaching Status and CHAMPUS Volume in Children's Hospitals and Nonexempt Hospitals 1986–1987

	Children's Hospitals				Nonexempt Hospitals			
	Hospitals[a]		Discharges[b]		Hospitals[a]		Discharges[b]	
	Number	%	Number	%	Number	%	Number	%
Teaching status[c]								
Nonteaching	20	40.8	2,615	63.1	2,486	77.1	15,502	59.8
Minor teaching	19	38.8	922	22.3	596	18.5	6,622	25.6
Major teaching	10	20.4	605	14.6	143	4.4	3,778	14.6
Number of CHAMPUS pediatric discharges								
1–24	14	28.6	156	3.8	3,022	93.7	13,911	53.7
25–99	26	53.1	1,617	39.0	178	5.5	7,957	30.7
≥ 100	9	18.4	2,369	57.2	25	0.8	4,034	15.6
Total	49	100.0	4,142	100.0	3,225	100.0	25,902	100.0

[a]Results represent hospitals having at least one CHAMPUS pediatric discharge in the 12-month period from July 1986 through June 1987.

[b]Discharges are restricted to patients under 18 years of age, excluding neonates and selected DRGs. See text for details.

[c]Teaching status is defined on the basis of the resident-to-bed (RB) ratio: nonteaching, RB ratio equals 0; minor teaching, RB ratio is less than or equal to 0.25; major teaching, RB ratio is greater than 0.25.

Table 4

Case Mix[a] for CHAMPUS Pediatric Discharges[b] by Teaching Status in Children's Hospitals and Nonexempt Hospitals 1986–1987

Teaching Status of Hospital	Children's Hospitals	Nonexempt Hospitals
Nonteaching	0.82	0.60
Minor teaching	0.83	0.70
Major teaching	1.12	1.00
All hospitals	0.87	0.68
Number of discharges	4,142	25,900

[a]Case mix is defined as the sum of the DRG relative weights for all cases divided by the number of cases.
[b]Discharges are restricted to patients under 18 years of age, excluding neonates and selected DRGs.

percent higher for a pediatric patient in a children's hospital than in a nonexempt hospital.

The average daily standardized charges were similar among the three teaching categories (nonteaching, minor teaching, and major teaching) both for children's hospitals and nonexempt hospitals (Table 5). The similarity of daily charges among the three categories indicates that the higher case mix in teaching hospitals, seen in Table 4, is primarily due to the fact that those patients are more likely to be in DRGs that have longer lengths of stay.

To evaluate the possibility of using hospital-specific adjustments for children's hospitals, we compared the variation in charges among pediatric patients in children's hospitals and among those in nonexempt hospitals (Table 6). If the distributions were markedly different, hospital-specific adjustments might be incorporated in the PPS for children's hospitals. It should be pointed out, however, that such hospital-specific adjustments would be based on relatively unstable estimates. There are few children's hospitals; only 49 children's hospitals in our analytic sample had any CHAMPUS pediatric patients. In addition, most of the hospitals have fewer than 100 patients, resulting in unstable estimates at the hospital level.[2]

[2]See App. B for a more complete discussion of the implications of different numbers of patients for hospital-specific payment parameters.

Table 5

Characteristics of CHAMPUS Pediatric Patients in Children's Hospitals and Nonexempt Hospitals 1986–1987

	Number of Discharges	Sum of Total Charges[a] ($)	Average Daily Standardized Charges[b] ($)	Total Patient Days	Average LOS
Children's hospitals[c]					
Nonteaching	2,615	10,867,663	1053	10,396	4.0
Minor teaching	922	3,933,688	819	4,204	4.6
Major teaching	605	4,804,723	1024	3,184	5.3
All children's hospitals	4,142	19,606,075	992	17,784	4.3
Nonexempt hospitals[c]					
Nonteaching	15,502	30,061,204	655	49,975	3.2
Minor teaching	6,622	19,603,493	726	25,595	3.9
Major teaching	3,778	20,587,134	707	20,572	5.4
All nonexempt hospitals	25,902	70,251,831	685	96,142	3.7

[a]These charges are based on total charges reported on the claim excluding selected subcharges.

[b]The average daily standardized charges are the sum of total charges reported on the claim excluding selected subcharges standardized for differences in wage indexes and indirect medical education expenses and divided by total patient days.

[c]Discharges are restricted to patients under 18 years of age, excluding neonates and selected DRGs.

Table 6

Variation in Adjusted Charges Across Hospitals for CHAMPUS Pediatric Patients by Teaching Status for Children's Hospitals and Nonexempt Hospitals 1986–1987

	Number of Hospitals	Average Adjusted Total Charges[a] ($)	Ratio to Mean at Percentile[b]			
			10th	25th	75th	90th
Children's hospitals						
Nonteaching	20	5089	0.65	0.73	1.20	1.70
Teaching	29	4615	0.57	0.70	1.15	1.40
All children's hospitals	49	4914	0.59	0.70	1.10	1.49
Nonexempt hospitals						
Nonteaching	2486	3543	0.42	0.62	1.12	1.46
Teaching	739	3881	0.47	0.65	1.12	1.59
All nonexempt hospitals	3225	3679	0.43	0.61	1.10	1.46

[a]Adjusted charges are defined as the average standardized charge divided by the case mix. The standardized charges are total charges reported on the claim excluding selected subcharges, standardized for wage indexes and indirect medical education expenses. Case mix is defined in Table 4.

[b]These ratios are calculated by dividing the hospital-specific adjusted charge at a given percentile by the mean adjusted charge.

To estimate the variation in charges, we first calculated the average standardized charge for each hospital, dividing by case mix to adjust for differences in type of patients among hospitals. We then divided the hospital-specific values at the 10th, 25th, 75th, and 90th percentiles by the mean. These ratios indicate the general shape of the distribution of charges. The minor and major teaching categories were collapsed because there were fewer discharges in these subgroups.

Even after adjusting for differences in case mix, the average total charges for patients in children's hospitals were 34 percent higher than for pediatric patients in other nonexempt hospitals (Table 6). The average total charges, adjusted for case mix, were 44 percent higher for nonteaching children's hospitals than nonteaching, nonexempt hospitals. There was a smaller differential between teaching hospitals; charges for children's hospitals were only 19 percent higher than for nonexempt hospitals.

Based on Table 6, the ratios of the percentile values to the mean appear to be similar for children's hospitals and nonexempt hospitals. Although the ratio of the 90th percentile to the mean is higher for nonteaching children's hospitals than nonexempt hospitals, this measure is slightly lower for the teaching children's hospitals. In addition, the interquartile ranges are slightly higher for nonexempt hospitals, and the spread between the top and bottom deciles for teaching hospitals is slightly lower for children's hospitals.

AN ALTERNATIVE CLASSIFICATION SYSTEM: PEDIATRIC-MODIFIED DRGS

The DRG classification system has been criticized for its lack of relevance to pediatric diagnoses, for inappropriate age splits to accommodate pediatric patients, and particularly, for the inability of the neonatal DRG categories to predict resource use successfully for the youngest group of pediatric patients (Restuccia and Payne, 1985). NACHRI refined the DRG classification system to identify the more complicated and resource-intensive conditions that occur most frequently in children. The result of this major effort was a revised classification system, called the Children's Diagnosis-Related Groups (CDRGs) (NACHRI, December 1985).

To evaluate the effect of using CDRGs, we assigned Pediatric-Modified DRGs (PM-DRGs), a more recent version of the CDRGs, to all CHAMPUS pediatric claims. The PM-DRGs were assigned using the Pediatric-Modified Grouper Version 5.0 from Health Systems International (Health Systems International, 1988). This grouper requires information on birthweight and duration of mechanical ventilation to assign PM-DRGs to neonates. However, because the CHAMPUS claims contain neither of these variables, PM-DRGs could not be assigned to neonates. Thus, neonates are not included in the evaluation of PM-DRGs described below.

For all non-neonatal pediatric cases, we compared the explanatory power of the PM-DRGs and the 1988 DRGs, using the R-squared value from a multivariate regression. This technique has been used in other studies; however, using R-squared as the measure of the PM-DRG system's ability to predict resource use may mask small improvements over the DRG system. The R-squared value from linear model theory is based in part on a weighted average of the sample variances from each PM-DRG category, with the weights proportional to the sample size in each category. This means that the R-squared value will improve very little unless the variances in the

PM-DRG categories with large sample sizes are reduced substantially. This reduction is unlikely, however, since upon inspection, the DRG categories with the largest numbers of patients were left largely unchanged under the PM-DRG system.

In a regression of standardized charges on the classification variables, the PM-DRGs explained 2.5 percent more of the variance in charges for CHAMPUS pediatric patients than DRGs (Table 7). Standardized charges are adjusted for indirect medical education expenses and wage indexes. When outliers beyond three standard deviations from the DRG-specific geometric mean are excluded, PM-DRGs explain 3.6 percent more of the variance in charges than DRGs.

Controlling for additional characteristics related to reimbursement under prospective payment does not increase the variance explained. We regressed standardized charges on the DRG or PM-DRG variables and dummy variables representing large urban, other urban, and children's hospitals. The PM-DRGs explain 2.5 percent more of the variance in charges than DRGs, including outliers; PM-DRGs also explain 3.6 percent more of the variance than DRGs, when the statistical outliers are excluded (Table 7).

THREE DRG-BASED PAYMENT SYSTEMS FOR CHILDREN'S HOSPITALS

Because children's hospitals have consistently higher charges for pediatric patients than other hospitals, OASD(HA) decided to classify children's hospitals as a separate group in calculating the basic standardized amounts. The difference between the children's hospital standardized amount and the standardized amount that would apply if the hospital was not a children's hospital (large urban, other urban, or rural) will be called the "children's hospital differential."

In recognition of the possibility that "general hospitals cross-subsidize pediatric care with adult patients while children's hospitals cannot" (*Federal Register*, June 3, 1988), OASD(HA) also decided to implement a reimbursement policy for children's hospitals that is "revenue neutral." Revenue neutrality is defined as a reimbursement policy with payment parameters such that total CHAMPUS reimbursement under the DRG-based system would be equal in the base year to the actual payments made to children's hospitals as a group under a billed-charges system.

Table 7

R-Squared Values from Regressions of Standardized Charges on DRGs Versus PM-DRGs CHAMPUS Pediatric Patients 1986–1987

	Including Outliers		Excluding Outliers[a]	
Independent Variables	DRG	PM-DRG	DRG	PM-DRG
DRG or PM-DRG dummy variables only	0.254	0.279	0.335	0.371
DRG or PM-DRG dummy variables plus other payment variables[b]	0.261	0.286	0.341	0.377
Sample size	30,044	30,044	29,796	29,794

[a]All cases with charges more than 3 standard deviations from the geometric mean for a particular DRG or PM-DRG were excluded as outliers.

[b]The complete specification for this linear regression model included dummy variables for large urban, other urban, and children's hospital, as well as for each DRG or PM-DRG with at least one discharge, except DRG 475 or PM-DRG 806.

Our preliminary findings, not presented here, showed that some children's hospitals might lose large amounts of revenue under the CHAMPUS DRG-based reimbursement system for general hospitals. On the basis of these findings, OASD(HA) requested that we evaluate the financial impact of three alternative reimbursement policies for children's hospitals, all of which incorporated a children's hospital differential and revenue neutrality. These three policies differ in the definitions of, and the marginal cost factors for, long-stay and cost outliers. The definition of short-stay outliers remains unchanged under all three policies. The new outlier policy is used in all calculations for nonexempt hospitals throughout this report. The three alternative policies for children's hospitals are defined as follows:

(1) Under the *new outlier policy* (which CHAMPUS adopted on October 1, 1988, for general hospitals), long-stay outliers are identified using a threshold of the lesser of 3.00 standard deviations or 24 days from the DRG-specific geometric mean. The payment level for each day beyond the threshold is 60 percent of the per-diem rate. Cost outliers are identified using a threshold equal to the greater of twice the DRG basic payment or $27,000. The payment level is 80 percent of costs exceeding the threshold.

(2) Under the *old outlier policy* (in effect before October 1, 1988, for CHAMPUS and Medicare prospective payment), long-stay outliers were identified using a *lower* threshold of the lesser of 1.94 standard deviations or 17 days from the DRG-specific geometric mean. The payment level was the same as under the new outlier policy, 60 percent. Cost outliers were identified using a lower threshold equal to the greater of twice the DRG basic payment or $13,500. The payment level was lower than under the new outlier policy, 60 percent instead of 80 percent.

(3) A *combined outlier policy* would combine features of the above two policies, resulting in the most generous reimbursement policy for outliers. The thresholds for long-stay and cost outliers would be the same as for the old outlier policy. The payment levels for both types of outliers would be the same as under the new outlier policy.

We estimated the standardized amount for children's hospitals under each of these three policies using our 1986–1987 data. In each case, the standardized amount was adjusted to be revenue neutral. The charges were not reduced using the Medicare cost-to-charge ratio, to ensure consistency with the policy likely to be adopted for reimbursement of children's hospitals.

In addition, we looked at the number of outliers, and patient days and charges represented by these outliers, under all three policies for children's hospitals and under only the new outlier policy for pediatric patients in nonexempt hospitals. As the final step of our analysis, we evaluated the financial impact of the three policies on children's hospitals and of the new outlier policy on nonexempt hospitals.

The standardized amount for children's hospitals was $4923 under the new outlier policy. This amount is 82 percent higher than the standardized amount for other services in large urban areas and 90 percent higher than that for other urban areas. This standardized amount was used in simulating the DRG-based payments that would be made to children's hospitals under the new outlier policy.

Under the old outlier policy, the standardized amount for children's hospitals was $4731. This represents a 75-percent increase over large urban areas and an 82-percent increase over other urban areas. Under the combined outlier policy, the standardized amount for children's hospitals was $4671. This represents a 73-percent increase over large urban areas and an 80-percent increase over other urban areas. The standardized amounts under the old and combined outlier

policies are lower than under the ne outlier policy, because more of the total amount reimbursed to chil ren's hospitals would be paid in the form of outlier payments under the old and combined outlier policies. Because of the revenue neutrality, increasing the outlier payments decreases the average basic payment, i.e., the standardized amount.

OUTLIERS AND FINANCIAL IMPACT UNDER THE DRG-BASED ALTERNATIVES

A high percentage of pediatric discharges in both children's hospitals and nonexempt hospitals was classified as short-stay outliers. Between 27 and 28 percent of pediatric stays fell on or below the cutoff for short stays under the new outlier policy (Table 8), and a similar percentage was identified as short-stay outliers under the old and combined policies (Table 9). This result, however, is not surprising

Table 8

Discharges, Patient Days, and Charges Classified as Short-Stay, Long-Stay, or Cost Outliers for Pediatric Patients in Children's Hospitals and Nonexempt Hospitals Under the New Outlier Policy for DRGs 1986–1987

		Children's Hospitals[a]		Nonexempt Hospitals[b]	
	Outlier Category	Number	%	Number	%
I.	Number of discharges				
	Short-stay	1,113	26.9	7,280	28.1
	Long-stay	50	1.2	251	1.0
	Cost	28	0.7	38	0.1
II.	Number of patient days				
	Short-stay	1,123	6.3	7,326	7.6
	Long-stay	1,066	6.0	7,104	7.4
	Cost	588	3.3	1,293	1.3
III.	Charges ($)				
	Short-stay	1,755,874	9.0	8,119,681	11.6
	Long-stay	1,030,006	5.3	4,466,976	6.4
	Cost	1,825,682	9.3	2,778,949	4.0

[a]Results represent 4,142 patients in children's hospitals under 18 years of age, excluding neonates and selected DRGs.

[b]Results represent 25,902 patients in nonexempt hospitals under 18 years of age, excluding neonates and selected DRGs.

Table 9

Discharges, Patient Days, and Charges Classified as Short-Stay, Long-Stay, or Cost Outliers for Pediatric Patients in Children's Hospitals Under the Two Alternative Outlier Policies for DRGs[a] 1986–1987

		Old Outlier Policy		Combined Outlier Policy	
	Outlier Category	Number	%	Number	%
I.	Number of discharges				
	Short-stay	1,111	26.8	1,111	26.8
	Long-stay	192	4.6	187	4.5
	Cost	59	1.4	64	1.5
II.	Number of patient days				
	Short-stay	1,120	6.3	1,120	6.3
	Long-stay	2,800	15.7	2,698	15.2
	Cost	1,069	6.0	1,171	6.6
III.	Charges ($)				
	Short-stay	1,668,625	8.5	1,668,625	8.5
	Long-stay	2,416,103	12.3	2,188,031	11.2
	Cost	2,815,199	14.4	3,043,271	15.5

[a]Results represent 4,142 patients in children's hospitals under 18 years of age, excluding neonates and selected DRGs.

when one looks at the distribution of length of stay for pediatric patients. Almost 27 percent of patients in children's hospitals and a slightly higher percentage of pediatric patients in nonexempt hospitals had a length of stay (LOS) of one day; all of these are classified as short-stay outliers.

The percentage of discharges classified as long-stay or cost outliers under the new outlier policy was higher in children's hospitals than in nonexempt hospitals (Table 8). As expected, the long-stay and cost outliers together account for a disproportionately high percentage of patient days and total charges in both types of hospitals.

Table 9 provides similar information for the alternative outlier policies we considered for children's hospitals. Under the old policy, the more inclusive definitions of long-stay and cost outliers lead to a much higher percentage of both; the increase in long-stay outliers is especially large. The definitions of long-stay and cost outliers are the same under the combined outlier policy as they are under the old policy. Therefore, the percentage of outliers under the combined outlier

policy is very close to that under the old outlier policy. However, because of a higher per-diem payment factor for cost outliers under the combined outlier policy, a handful of discharges would be reimbursed as cost outliers rather than long-stay outliers, as they were under the old outlier policy.

As the final step in our evaluation of alternative reimbursement policies, we simulated DRG payments for CHAMPUS pediatric patients to estimate the financial impact of the policies on children's and nonexempt hospitals. The percentage difference between the hypothetical reimbursed amount and actual charges is shown in Table 10. Each percentage in Table 10 represents how much more or less than the actual charges the hospitals would receive under the CHAMPUS PPS. A positive percentage means the hospitals would receive more under the DRG-based payment system, and a negative percentage means they would receive less.

Because of the revenue-neutral policy, children's hospitals as a group would receive payments under a DRG-based system including capital

Table 10

Percentage Difference Between DRG Reimbursement and Actual Charges by Teaching Status and CHAMPUS Volume in Children's Hospitals and Nonexempt Hospitals Under the New Outlier Policy for DRGs 1986–1987

	Children's Hospitals[a]			Nonexempt Hospitals[b]
	New	Old	Combined	New
Teaching Status				
Nonteaching	-5.7	-6.1	-6.3	-26.7
Minor teaching	7.4	8.9	8.6	-27.7
Major teaching	6.8	6.4	7.1	-25.2
Number of CHAMPUS pediatric discharges				
1–24	5.7	9.7	10.3	-25.3
25–99	-1.5	-0.2	0.2	-29.0
100 or more	0.8	-0.5	-0.9	-25.2
All hospitals	0.0	0.0	0.0	-26.6

[a]Results represent 4,142 patients in children's hospitals under 18 years of age, excluding neonates and selected DRGs.

[b]Results represent 24,536 patients in nonexempt hospitals under 18 years of age, excluding neonates, selected DRGs, and 1,366 claims from hospitals with incomplete information on capital and medical education expenditures.

and medical education add-ons that would equal actual charges. However, some subgroups of hospitals and some individual children's hospitals would receive more under prospective payment than their actual charges, and some would receive less. Children's hospitals with teaching programs would receive, on average, more than their actual charges under all three outlier policies (Table 10). Children's hospitals without teaching programs, however, would receive less than their actual charges, again under all three outlier policies. Children's hospitals with fewer than 25 CHAMPUS pediatric discharges would be reimbursed substantially more than actual charges under all three outlier policies; these hospitals would receive the most under the combined outlier policy. Those with 100 or more CHAMPUS pediatric discharges would be reimbursed an amount within 1 percent of actual charges under the three policies.

For pediatric patients in nonexempt hospitals, the amount reimbursed under the new outlier policy would be almost 27 percent less than actual charges (Table 10). This much lower level of reimbursement reflects a cost-to-charge ratio of 0.64 used for nonexempt hospitals in the CHAMPUS PPS.[3] Nonteaching hospitals fare slightly worse than teaching hospitals, a pattern similar to children's hospitals. Among the nonexempt hospitals, those treating either fewer than 25, or 100 or more CHAMPUS pediatric patients are better off than those that treated between 25 and 99 patients (Table 10).

Looking at the financial impact on individual children's hospitals, we found that some hospitals would receive more than 10 percent above their actual charges, and others would lose more than 35 percent under all three outlier policies (Table 11). Among the nine children's hospitals with 100 or more CHAMPUS pediatric discharges, eight hospitals would be reimbursed 90 percent or more of their actual charges. One hospital would be reimbursed between 75 and 89 percent of actual charges under both the new and combined outlier policies. Under the old outlier policy, seven hospitals with 100 or more patients would receive 90 percent or more of actual charges, and two hospitals would receive between 75 and 89 percent of actual charges.

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[3]The cost-to-charge ratio of 0.64 excludes cost passthroughs for medical education and capital costs. If included, the total average would increase to 0.72 of the nonexempt hospitals' actual charges.

Table 11

Number of Children's Hospitals by Ratio of Reimbursement to Charges and Number of CHAMPUS Pediatric Discharges Under Three Outlier Policies for DRGs 1986–1987

	Ratio of Reimbursement to Charges	Number of CHAMPUS Pediatric Discharges			
		1–24	25–99	100 or more	Total
I.	New outlier policy				
	More than 1.1	8	13	3	24
	0.9–1.1	2	7	5	14
	0.75–0.89	2	4	1	7
	0.65–0.74	1	2	0	3
	Less than 0.65	1	0	0	1
II.	Old outlier policy				
	More than 1.1	9	13	2	24
	0.9–1.1	2	7	5	14
	0.75–0.89	1	5	2	8
	0.65–0.74	1	1	0	2
	Less than 0.65	1	0	0	1
III.	"Combined" outlier policy				
	More than 1.1	9	13	2	24
	0.9–1.1	2	7	6	15
	0.75–0.89	2	5	1	8
	0.65–0.74	0	1	0	1
	Less than 0.65	1	0	0	1
	Total	14	26	9	49

OUTLIERS AND FINANCIAL IMPACT UNDER THE PM-DRG-BASED SYSTEM

As reported above, we measured a modest improvement in the explanatory power of the PM-DRG classification over the DRGs. To evaluate the financial impact of using PM-DRGs, we simulated the distribution of outliers and reimbursement payments based on this alternative classification system. The results are summarized below. The numerical results are shown in App. A.

In summary, using the PM-DRG classification system instead of the DRG system changes very little. About the same percentages of short-stay, long-stay, and cost outliers were identified using PM-DRGs as DRGs. This result is disappointing, since one possible improvement of the PM-DRG system over the DRG system might

have been fewer outliers, because of the more precise identification of resource-intensive conditions. In addition, the pattern of financial impact on individual children's hospitals using the PM-DRG classification system was very similar to the results using the DRGs, under all three outlier policies and for all teaching and patient-volume categories. The financial impact on nonexempt hospitals serving pediatric patients is almost identical under the two classification systems. Some individual children's hospitals would fare slightly better and some slightly worse under a PPS based on PM-DRGs. Of the nine hospitals with 100 or more CHAMPUS discharges, only two would receive reimbursements of less than 90 percent of their actual charges under any of the three outlier policies; this result is similar to the impact of the policies using the DRG classification system.

In deciding whether to use PM-DRGs as the basis for reimbursing hospitals for CHAMPUS pediatric patients, one must weigh the change in explanatory power of the PM-DRGs (over DRGs) at the patient level against the change in reimbursement at the hospital level. We found that PM-DRGs predict changes at the patient level more precisely than DRGs. However, we also found that, at the hospital level, there was very little difference between PM-DRGs and DRGs in the total reimbursement that individual hospitals received. In addition, the administrative cost of supporting two classification systems—PM-DRGs for children and DRGs for adults—within the CHAMPUS PPS would be high.

4. DRG-BASED PAYMENT FOR SUBSTANCE-ABUSE SERVICES IN NONEXEMPT HOSPITALS AND UNITS

In October 1987, when CHAMPUS first introduced its prospective payment system based on DRGs, substance-abuse services were exempted from the new payment system. In this section, we provide background information on the substance-abuse DRGs, compare the distribution of CHAMPUS and Medicare cases under the recent restructuring of these DRGs, describe the proposed DRG payment system, and assess its performance as a method of reimbursing for CHAMPUS services.

Substance-abuse hospitals and substance-abuse units in general acute-care hospitals were originally exempt from Medicare's initial PPS, implemented in 1983. The original exemption, scheduled to end in October 1985, was twice extended in response to concerns raised by the substance-abuse treatment and research communities that the original substance-abuse DRGs had been derived from a database too small to adequately determine differences in resource utilization. As a result, systematic risks to providers might be introduced into the payment structure, because the assigned DRG weights probably underestimate the relative costs of substance-abuse admissions. These concerns were not alleviated by HCFA's 1985 revisions to the substance-abuse DRGs.

To address these concerns, the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) reabstracted and analyzed data (Table 12) from a 20-percent sample of FY 1984 Medicare substance-abuse discharges.[1] ADAMHA's major findings were: (1) The FY 1984 Medicare claims file used to establish the original (1983) and the proposed (1985) DRGs had significant reporting problems; (2) the existing structure of DRGs 434 and 435 did little to differentiate between patients' hospital costs or lengths of stay; (3) a number of individuals leave treatment early against medical advice, but reimbursement is not adjusted to reflect the significantly shorter lengths of stay; (4) the presence of nonsubstance-abuse and nonpsychiatric complications

[1]ADAMHA worked together with the National Institute of Mental Health, the National Institutes on Drug and Alcohol Abuse, HCFA, and the Office of the Assistant Secretary for Planning and Evaluation in the Department of Health and Human Services.

Table 12

Percentage of Variation in Resource Use Explained by Psychiatric and Substance-Abuse DRGs

Authors	Sample Studied	% Variation Explained	
		Costs	LOS
McGuire et al. (1987)	ADM admissions during 1981–82, insurance claims data from large private health insurance carrier (Blue Cross/Blue Shield)	7.7	—
Mitchell et al. (1987)	Medicare admissions in four states to general hospitals, 1982 Medicare Part A claims data	MI: 3.9 NJ: 3.6 NC: 3.6 WA: 5.3	8.2 4.4 7.5 7.8
Schumacher et al. (1986)	ADM discharges from 32 private psychiatric hospitals during 1983–84 (MDC 20 discharges only)	—	3.9 1.7
Taube et al. (1984)	Admissions during 1980 from two data sources: Public Mental Hospitals (NIMH & State Mental Health Authorities) and private psych. hospitals (NIMH & NAPPH); Dischgs. in Feb. 1981 from general hospitals with psych units (NIMH & AHA).	—	3.2
Young (1985)	Adult ADM admissions to short-term general hospitals in western Penn., Blue Cross of Western Pennsylvania claims data.	—	15.0

ADM = Alcohol, drug abuse and mental health discharges (DRGs 424–437).

and comorbidities is a significant predictor of hospital costs and length of stay; and (5) age, polysubstance abuse, and type of drug are not important predictors of resource consumption (*Federal Register*, June 10, 1987). All of these findings pertain to the Medicare population and may or may not hold for the under-65 CHAMPUS population.

Based on ADAMHA's recommendations and HCFA's own analyses of Medicare claims data from FY 1985 and FY 1986, the substance-

abuse DRGs were reconfigured and the weights were recalibrated, effective September 1, 1987. The most important change combined DRGs 434 and 435, and then resplit these cases on the basis of presence or absence of nonsubstance-abuse and nonpsychiatric complications or comorbidities. HCFA had found no statistically significant difference in the mean charges between the old DRGs 434 and 435, which distinguished between alcohol/drug-abuse or dependence. Table 13 compares this most recent revision of the substance-abuse DRGs with the 1987 version. Upon concluding its analysis in October 1987, HCFA removed the Medicare exemption for substance-abuse hospitals and substance-abuse units of general hospitals and began to prospectively reimburse all substance-abuse cases using the latest DRGs (incorporated into the 1988 DRG grouper).[2]

The 1988 grouper, applied to Medicare cases, evenly splits DRGs 434 and 435. Table 14 shows how restructuring substance-abuse DRGs affects the distribution of CHAMPUS cases. Most CHAMPUS

Table 13

Comparison of 1987 and 1988 Substance-Abuse DRGs

DRG	1987 Grouper	1988 Grouper
433	Alcohol/drug abuse and induced organic mental disorders, left against medical advice	Alcohol/drug abuse or dependence, left against medical advice
434	Alcohol/drug abuse, detoxification, induced mental syndrome except dependence and/or other symptomatic treatment	Alcohol/drug abuse or dependence, detoxification or other symptomatic treatment, with complications or comorbidities
435	Alcohol/drug dependence and/or other symptomatic treatment	Alcohol/drug abuse or dependence, detoxification or other symptomatic treatment, without complications or comorbidities
436	Alcohol/drug dependence with rehabilitation therapy	Same as DRG 436 under 1987 Grouper
437	Alcohol/drug dependence, combined rehabilitation and detoxification therapy	Same as DRG 437 under 1987 Grouper

SOURCE: *Federal Register*, June 10, 1987.

[2]For convenience, we refer to the older 1985–1987 DRGs as those contained in the 1987 grouper and the newer DRGs as those contained in the 1988 grouper.

Table 14

Distribution of CHAMPUS Substance-Abuse Patients: 1987 Grouper vs. 1988 Grouper

1987 Grouper DRGs	1988 Grouper DRGs					
	433	434	435	436	437	Total
433	154	0	0	0	0	154
434	0	48	397	5	2	452
435	0	246	1461	11	3	1721
436	0	0	0	397	0	397
437	0	0	0	0	90	90
Total	154	294	1858	413	95	2814

patients have alcohol, rather than drug-abuse or dependence problems, and few have complications or comorbidities. Further, few appear to have been provided with rehabilitative services. Therefore, under either the 1987 or 1988 DRG definitions, the majority of CHAMPUS cases fall into a single DRG (DRG 435, using the 1988 Grouper). The 1988 Grouper DRG definitions will be used in the rest of this section.

The CHAMPUS and Medicare populations result in different DRG weight estimates for substance-abuse services (Table 15). For CHAMPUS, DRG 435 has been split on the basis of age: CHAMPUS DRG 435 consists of all patients receiving detoxification services with no comorbidities and who are less than 21 years old; CHAMPUS DRG 435.21 consists of those receiving the same services who are 21 years or older. DRG 435 was split into two groups because in this DRG (which contained two-thirds of all substance-abuse cases) the average charges between the two age groups differed significantly, enough to justify a new DRG. We discuss the rationale for splitting DRG 435 into two categories later in more detail.[3] The CHAMPUS weights are substantially higher overall and so, on average, have higher relative weights compared to nonsubstance-abuse DRGs. Correspondingly, CHAMPUS substance-abuse payments are higher than payments for other DRGs.[4] Long-stay threshold values are much greater for CHAMPUS than for Medicare in DRGs 435, 436, and 437. The

[3]There are no comparable Medicare DRG weight nor threshold values for DRG 435.21, since Medicare does not use an age break for this DRG.

[4]The CHAMPUS weights do not represent the official weights CHAMPUS implemented for FY 1989. Instead, the weights reported here are those calculated from CHAMPUS hospital discharge data provided to RAND by Lewin/ICF.

Table 15

Comparison of CHAMPUS and Medicare DRG Weights and Outlier Thresholds for Substance-Abuse DRGs

	CHAMPUS			Medicare	
		Outlier Threshold[a]			
DRG	DRG Weight[b]	Short Stay	Long Stay	DRG Weight[b]	Long-Stay Outlier Threshold[a]
433	0.824	1	29	0.42	27
434	1.237	1	31	0.81	30
435	1.704	1	37	0.59	29
435.21	1.271	1	33	—	—
436	1.739	5	43	0.98	35
437	1.606	5	42	1.33	38

[a]Threshold values are based on the new outlier policy that Medicare and CHAMPUS adopted on October 1, 1988.

[b]The Medicare DRG weights reported are those for FY 1988 to allow a correct comparison of Medicare's weights with those for CHAMPUS (using the 1988 grouper). However, since the outlier threshold values changed for FY 1989 and were the ones CHAMPUS adopted, we report Medicare's FY 1989 threshold values as well for comparison. Reference: *Federal Register*, September 1, 1987; *Federal Register*, September 30, 1988.

differences for DRG 435 and 436 are particularly large. The Medicare payment system does not recognize short-stay outliers.

All of the studies that have examined the ability of a DRG system to predict resource utilization have combined psychiatric and substance-abuse services. They estimated the proportion of the total variability in resource use, as measured by either length of stay or hospital costs, that DRGs explain and found that a relatively small proportion of the total variation was explained (Table 12).

In addition, alternative classification systems have also been proposed for grouping patients according to differences in resource utilization (see Horgan and Jencks, 1987, for a summary of these systems). The proposed systems either have been variants of the current DRG system (e.g., DRGs adjusted for age, presence or absence of comorbidities) or have regrouped patients using different criteria altogether (e.g., transfer or readmission status). Some schemes have used data obtainable only from the medical record, making these classification schemes infeasible for reimbursement purposes. Schumacher et al. (1986) and others have concluded that none of the proposed systems performs significantly better than the current DRG

system in predicting patient resource use for the Medicare population (Table 16).

Given these conclusions and HCFA's recent decision to begin reimbursing all substance-abuse cases prospectively based on the newly revised DRGs, OASD(HA) requested that we examine the implications of a DRG-based system to reimburse for CHAMPUS substance-abuse services.

CHARACTERISTICS OF CHAMPUS SUBSTANCE-ABUSE SERVICES

Of the substance-abuse cases to be reimbursed under the CHAMPUS DRG system,[5] two-thirds of the CHAMPUS substance-abuse admissions we analyzed were in general acute-care hospitals (Table 17).[6] Fewer than 1.0 percent were in specialized freestanding alcohol/drug

Table 16

Variation in Resource Use Explained by Alternative Classification Systems

	Percent Variation Explained			
	Alternative System		DRGs	
Classification System	Costs	LOS	Costs	LOS
Case-mix groupings (NAPPH, 1985)	—	7.8	—	3.9
Clinically related groups (Mitchell et al., 1987)	4.4–9.6	5.4–12.3	3.6–5.3	4.4–8.2
Disease staging (Mitchell et al., 1987)	5.7–10.5	5.8–12.0	3.6–5.3	4.4–8.2

[5]We only analyze those substance-abuse cases in general acute-care hospitals without a Medicare PPS-exempt psychiatric unit and in alcohol/drug hospitals. Those CHAMPUS beneficiaries receiving treatment for substance abuse in psychiatric hospitals and in general acute-care hospitals with exempt psychiatric units will be reimbursed under the proposed per-diem system described in Sec. 6, Per Diem Payment for Psychiatric and Substance-Abuse Services in Exempt Psychiatric Hospitals and Units. Out of a total of 4304 CHAMPUS substance-abuse cases, 1490 (35 percent) are included in the proposed per-diem system.

[6]The analyses in the rest of this section are based on CHAMPUS claims processed between July 1, 1986, and June 30, 1987.

Table 17

Characteristics of CHAMPUS Substance-Abuse Services Provided in Nonexempt Hospitals and Units 1986–1987

Type of hospital	Hospitals		Discharges		Mean Charges ($)[a]	Mean Length of Stay
	Number	%	Number	%		
General hospitals						
Nonteaching	466	59.1	1347	47.9	4999	15.2
Minor teaching	126	16.0	436	15.5	4397	15.1
Major teaching	9	1.1	23	<1.0	4647	13.6
Alcohol/drug hospitals	5	<1.0	45	1.6	6472	17.4
Hospitals with missing data[b]						
AHA ID	14	1.8	56	2.0	4679	17.8
Medicare ID	168	21.4	907	32.2	7275	21.5
All hospitals	788	100.0	2814	100.0	5654	17.3

[a]All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

[b]AHA ID refers to missing hospital type. Medicare ID indicates missing direct medical education and capital passthrough information.

facilities, but almost one-third were in the 183 hospitals that were missing identifiers (AHA and/or Medicare) and therefore could not be classified by provider type. As discussed below, we suspect that many of these hospitals are specialized substance-abuse facilities. The discharges from hospitals with missing Medicare identification data were included in calculating DRG parameters, but the financial impact of the DRG system on them could only be estimated partially.

Table 18 indicates that substance-abuse discharges of CHAMPUS beneficiaries were also concentrated in a relatively small number of facilities. Most hospitals had fewer than five CHAMPUS discharges. On the other hand, the 20 percent of hospitals that had five or more discharges accounted for approximately 63 percent of all CHAMPUS substance-abuse discharges.

RESOURCE USE BY DRG FOR CHAMPUS SUBSTANCE-ABUSE DISCHARGES

For the CHAMPUS population, Table 19 shows that the DRG system is only partially successful in classifying patients according to

Table 18

Distribution of Hospitals by Volume of CHAMPUS Substance-Abuse Discharges in Nonexempt Hospitals and Units 1986–1987

Discharges per Hospital	Hospitals		Discharges	
	Number	%	Number	%
1	374	47.6	374	13.3
2–4	256	32.5	668	23.7
5–10	108	13.7	746	26.6
11–24	38	4.8	572	20.3
25+	12	1.5	454	16.1
All hospitals	788	100.0	2814	100.0

NOTE: Percentages may not add to 100.0 because of rounding.

resource use. Some of the differences in mean length of stay and mean charges across DRG categories are statistically significant, others are not; the standard deviations within DRGs are large. In addition, the DRG system discriminates poorly between substance-abuse cases, with almost one-half of all substance-abuse discharges falling into one DRG, 435.21. A comparison between mean charges and length of stay for cases including and excluding outliers also indicates that outlier cases are extremely influential (Table 19).

The results presented in Table 19 suggest that, for the CHAMPUS population, DRG 435 (which contains two-thirds of all substance-abuse cases) should be split on the basis of age, since treatment of those under 21 years of age systematically costs more than treatment of those 21 years or older. The splitting of cases results in a shift of only 18.3 percent of CHAMPUS substance-abuse cases to the higher-cost DRG (DRG 435). No other DRGs showed a significant difference in treatment costs between the two age groups.

Table 20 shows, for each DRG, the distribution of outlier cases and the proportion of the total inpatient days and total charges accounted for by the outliers. Overall, 392 (13.9 percent) of substance-abuse discharges are length-of-stay or charge outliers. Long-stay or charge outliers are particularly concentrated in DRG 435. These outliers accounted for approximately 40 percent of the total inpatient days and total charges in that DRG. In contrast, of the nonsubstance-

Table 19

Charges and Lengths of Stay by 1988 Substance-Abuse DRG, With and Without Outliers 1986–1987

	Discharges		Charges ($)[a]		Length of Stay	
DRG	Number	%	Mean	Std. Dev.	Mean	Std. Dev.
With outliers						
433	154	5.5	3263	2797	8.8	8.1
434	294	10.4	5286	6057	12.2	10.3
435[b]	516	18.3	6514	5043	22.1	16.3
435.21[b]	1342	47.7	5240	4374	15.7	11.7
436	413	14.7	6917	3520	22.2	9.5
437	95	3.4	6345	3350	21.7	10.1
Total	2814	100.0	5654	4583	17.3	12.7
Without outliers						
433	150	5.7	3044	2412	8.1	6.7
434	288	10.9	4924	4669	11.7	9.7
435	411	15.5	4866	3670	15.9	11.2
435.21	1302	49.2	4997	4113	14.9	10.9
436	404	15.2	6767	3339	21.7	8.8
437	92	3.5	6074	2850	20.9	9.2
Total	2647	100.0	5166	3973	15.7	10.8

[a]All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

[b]DRG 435 includes all patients receiving detoxification services with no comorbidities (i.e., Medicare DRG 435) who are less than 21 years old. DRG 435.21 includes all those receiving the same services and who are 21 years or older.

abuse CHAMPUS cases, only 1.2 percent of the cases were outliers of any kind.[7]

To assess the ability of the DRG classification system to explain the variance in CHAMPUS charges, we carried out an analysis of variance (ANOVA). We tested two models: One was the basic DRG classification system with an adjustment for urban or rural location (Model 1); the second model also included age and gender to reveal whether these two variables significantly increase the explanatory

[7]Based on the claims sample used to calculate DRG weights and standardized amounts.

Table 20

Discharges, Inpatient Days, and Charges Classified As Outliers Among CHAMPUS Substance-Abuse Discharges, by DRG 1986–1987

DRG	Percent of Discharges		Percent of Inpatient Days		Percent of Total Charges	
	Short Stay	Long Stay or Charge	Short Stay	Long Stay or Charge	Short Stay	Long Stay or Charge
433	11.0	2.6	1.3	10.8	1.6	9.1
434	4.1	2.0	0.3	6.1	1.3	8.7
435	9.5	20.3	0.4	42.7	1.5	40.5
435.21	7.7	3.0	0.5	7.8	0.9	7.5
436	8.2	2.2	1.0	4.7	1.4	4.3
437	10.5	3.2	1.5	6.7	2.1	7.3

ability of the substance-abuse DRGs (Model 2). The results are reported in Table 21.

Overall, we found that the substance-abuse DRGs explained only 4.2 percent of the total variance in charges when outliers are included. Inclusion of age in the model raised the proportion of variance explained only slightly (from 4.2 percent to 4.4 percent). The inclusion of age and gender in the model did not significantly alter the coefficients in the basic model, with the exception of DRG 435. Inclusion of age and gender in the model resulted in the coefficient on DRG 435 becoming nonsignificant. However, the coefficient on age suggests that, on average, patients under 21 years have charges that are $820 higher than those 21 years or older. The coefficient for age was marginally insignificant, with a calculated p-value of 0.083. Thus, the ANOVA results suggest that a potential access problem might arise for younger CHAMPUS beneficiaries with substance-abuse problems in DRG 435 if hospitals were to be paid the same amount for them as for older patients, since, on average, they are more costly to treat. This finding provided the main impetus for including an age break in the substance-abuse DRG classification scheme.

CHARGES AND LENGTHS OF STAY, BY TYPE OF HOSPITAL

A key concern with a DRG-based system is whether certain types of hospitals (such as freestanding alcohol/drug hospitals) will be sys-

Table 21

Coefficients and R-Squared Values from Regression of Standardized Charges on Age, Sex, and Substance-Abuse DRGs 1986–1987

Variables	Model 1		Model 2	
	With Outliers	Without Outliers	With Outliers	Without Outliers
DRG 433	-2040[a]	-2006[a]	-2235[a]	-2065[a]
	(384)	(336)	(393)	(344)
DRG 434	90	-35	60	-45
	(291)	(254)	(291)	(254)
DRG 435	1227[a]	-150	383	-424
	(233)	(220)	(458)	(417)
DRG 436	1724[a]	1791[a]	1522[a]	1726[a]
	(255)	(223)	(272)	(236)
DRG 437	1088[b]	1060[b]	935	1013[b]
	(478)	(420)	(483)	(423)
Large urban	-448[b]	-179	-454[b]	-179
	(195)	(173)	(195)	(173)
Rural	-719[a]	-552[b]	-705[a]	-549[b]
	(243)	(215)	(243)	(215)
Missing MSA	-567	132	-568	-138
	(509)	(455)	(510)	(455)
Age dummy (1 if age > 20)	—	—	-820 (472)	-221 (430)
Sex dummy (1 if female)	—	—	-102 (357)	68 (339)
Age-sex interaction	—	—	-70 (407)	-89 (380)
R-squared	0.042	0.047	0.044	0.048

NOTE: All charges have been standardized for differences in the local wage index and in teaching status. Numbers in table are regression coefficients; numbers in parentheses are standard errors of the estimates. For DRG, the contrast group is DRG 435.21; for urban or rural location, the contrast group is small urban. Age and sex were not included as variables in Model 1.

[a]Coefficient is statistically different from zero at the 0.01 level.

[b]Coefficient is statistically different from zero at the 0.05 level.

tematically under (or over) reimbursed. For example, if a particular type of hospital treats a patient population that is more costly on average, but the payment system cannot distinguish between the different treatment needs of its patients, these hospitals will lose disproportionately more than other types of hospitals. Unfortunately, it is rarely possible to distinguish differences in patient mix or legitimate differences in treatment approaches from efficiency differences. An optimal payment system would recognize the former, but reimburse only for the costs of a "reasonably" efficient provider.

The few analyses that have been performed suggest that cost differences among facility types persist even after taking into account patient characteristics. One analysis of 1981–1982 ADM claims data for a major private insurance carrier showed that substantial differences in average costs among facility types remained even after adjusting for differences in case mix (i.e., controlling for the mix of DRGs). The hospital-based substance-abuse units and private psychiatric hospitals had the highest adjusted costs per case, whereas general hospitals that treated ADM patients in scatter beds were at least $1000 less costly than the average for all other types of facilities (McGuire et al., 1987).

Another way to measure differences in treatment costs among provider types is to analyze the distribution of patients that would be classified as length-of-stay outliers under a DRG system. Frank and Lave (1986) found that 6.5 percent of Medicare providers (general hospitals with psychiatric units) would have 30 percent or more of their discharges from these units classified as length-of-stay outliers. To assess whether cost differences exist across different types of CHAMPUS providers, we analyzed the distribution of long and short length-of-stay outliers and charge outliers by facility type.

Consistent with these other studies, there appear to be substantial differences in charges and lengths of stay for CHAMPUS providers. Although general hospitals account for approximately 65 percent of CHAMPUS discharges, the more specialized facilities (i.e., alcohol/drug hospitals) have significantly higher mean charges (Table 22). Those hospitals with missing Medicare data that we were unable to classify also had higher mean charges.[8] Even excluding outlier cases, the alcohol/drug hospitals and the hospitals with missing Medicare identifiers still have higher mean charges and significantly longer mean lengths of stay than any other provider type (Table 22).

[8]A limited telephone survey of these hospitals suggested that many are alcohol/drug hospitals.

Table 22

Charges and Lengths of Stay by Hospital Type for Substance-Abuse Discharges 1986–1987

Hospital Type	Charges ($)		Length of Stay (Days)	
	Mean	Std. Dev.	Mean	Std. Dev.
With outliers				
General hospitals				
Nonteaching	4999	4218	15.2	11.9
Minor teaching	4397	3283	15.1	12.3
Major teaching	4647	6536	13.6	12.4
Alcohol/drug hospitals[a]	6472	3200	17.4	9.4
Hospitals with missing data				
AHA ID	4679	3158	17.8	12.8
Medicare ID	7275	5228	21.5	13.2
All hospitals	5654	4583	17.3	12.7
Without outliers				
General hospitals				
Nonteaching	4704	3569	14.2	10.8
Minor teaching	4183	2998	13.9	10.5
Major teaching	3822	5323	12.0	10.3
Alcohol/drug hospitals[a]	6472	3200	17.4	9.4
Hospitals with missing data				
AHA ID	4544	3135	16.7	11.6
Medicare ID	6436	4702	18.5	10.5
All hospitals	5166	3973	15.6	10.8

[a]Figures for alcohol/drug hospitals are the same with and without outliers, because there were no outliers in these hospitals.

The ANOVA results in Table 23 also indicate that there are significant and substantial differences among the various types of hospitals. The coefficients for alcohol/drug hospitals and the providers unclassifiable because of missing Medicare identifiers are significantly different from the general acute-care hospitals. As mentioned earlier, teaching hospitals have lower average charges than nonteaching hospitals. However, the $399 difference in charges between nonteaching and major teaching general acute-care hospitals is not statistically significant.

Table 23

Coefficients and R-Squared Values from Regressions of Standardized Charges on Types of Hospital, Age, Sex, and Substance-Abuse DRGs 1986–1987

	Sample of Substance-Abuse Cases		All Substance-Abuse Cases	
Variables	Model 1	Model 2	Model 1	Model 2
DRG 433	-1762[a]	-1951[a]	-1705[a]	-1840[a]
	(367)	(376)	(294)	(302)
DRG 434	801[a]	779[a]	850[a]	821[a]
	(281)	(282)	(232)	(232)
DRG 435	1193[a]	398	1620[a]	1024[a]
	(223)	(438)	(182)	(357)
DRG 436	2751[a]	2570[a]	2499[a]	2366[a]
	(251)	(268)	(201)	(213)
DRG 437	2034[a]	1894[a]	2137[a]	2010[a]
	(461)	(466)	(390)	(396)
Large urban	-344	-353	-58	-62
	(190)	(189)	(150)	(150)
Rural	-542[b]	-531[b]	-20	-19
	(237)	(237)	(194)	(194)
Missing MSA	-2094[a]	-2089[a]	-1693[a]	-1698[a]
	(498)	(498)	(420)	(420)
Alcohol/drug hospital	2721[b]	2720[b]	3487[a]	3499[a]
	(1109)	(1108)	(894)	(894)
Hospitals with missing data Medicare ID	3273[a]	3253[a]	3923[a]	3910[a]
	(912)	(913)	(638)	(639)
AHA ID	666	704	1589[a]	1600
	(1070)	(1071)	(849)	(850)
Nonteaching	411	399	1326[b]	1324[b]
	(905)	(905)	(629)	(629)
Minor teaching	-309	-356	1000	975
	(921)	(922)	(640)	(641)
Psych. hospital	—	—	3176[a]	3169[a]
			(663)	(663)
Age dummy (1 if age > 20)	—	-866[b]	—	-603
		(452)		(365)
Sex dummy (1 if female)	—	-308	—	-38
		(341)		(279)
Age-sex interaction	—	70	—	2
		(389)		(316)
R-squared	0.128	0.130	0.107	0.108

NOTE: All charges have been standardized for differences in the local wage index and in teaching status. Numbers in table are regression coefficients; numbers in parentheses are standard errors of the estimates. For DRGs, the contrast group is DRG 435.21. For urban or rural location, the contrast group is small urban. For teaching status, the contrast group is major teaching hospital.

[a]Coefficient is statistically different from zero at the 0.01 level.

[b]Coefficient is statistically different from zero at the 0.05 level.

General acute-care hospitals with major teaching involvement and hospitals with missing Medicare identifiers have the highest proportion of discharges classified as long-stay or charge outliers (Table 24). The hospital types with the highest proportion of discharges classified as outlier cases are also the types more likely to be negatively affected by a DRG payment system since, on average, a long-stay or charge outlier is reimbursed for only 44 percent of charges.

Of particular concern is the finding that the hospitals we could not classify because of missing Medicare identifiers have especially high mean charges and long lengths of stay. Eleven percent of their discharges were either long-stay or charge outliers, with the outlier cases accounting for approximately 22 percent of these providers' total inpatient days and total charges. These providers account for 34 percent of CHAMPUS discharges for substance-abuse services, but without additional information, we were unable to fully assess the effect of a DRG-based payment system on them.

PREDICTION OF HOSPITAL-LEVEL RESOURCE USE FOR SUBSTANCE-ABUSE SERVICES

To assess how well the DRG system predicts resource use across hospitals, we used a method devised by Cotterill et al. (1986) to judge the overall efficacy of Medicare's DRG system. As discussed earlier, if the coefficient on the natural log of the case mix is insignificantly different from 1.0, we can conclude that, on average, hospitals are not facing a high level of systematic risk.

Table 25 shows a somewhat confusing situation. When all hospitals paid using the DRG system for CHAMPUS substance-abuse cases are considered, the coefficient of the case mix is close to 1.0. The hospitals face substantial random risk, however, with only 43 percent of the total variation explained, considerably lower than the 72 percent Cotterill estimated for Medicare's overall DRG reimbursement system. However, these results may largely reflect the fact that the majority of hospitals have only a few discharges resulting in unstable estimates of the average charge for their substance-abuse cases.

We used two methods to attempt to assess the effect of this skewed distribution of CHAMPUS substance-abuse cases: The regressions were repeated for hospitals with five or more discharges, and the regression estimates were weighted with the number of discharges. An analysis based only on hospitals with five or more discharges shows a very different relationship between case mix and average

Table 24

Discharges, Inpatient Days, and Charges Classified as Outliers Among CHAMPUS Substance-Abuse Discharges by Type of Hospital 1986–1987

Type of Hospital	Percent of Discharges		Percent of Inpatient Days		Percent of Total Charges[a]	
	Short Stay	Long Stay or Charge	Short Stay	Long Stay or Charge	Short Stay	Long Stay or Charge
General hospitals						
Nonteaching	10.5	3.3	0.9	9.6	1.8	9.0
Minor teaching	8.7	3.4	0.8	10.9	1.6	8.1
Major teaching	13.0	4.3	1.0	15.1	1.6	21.3
Alcohol/drug hospitals	4.4	0.0	0.3	0.0	0.3	0.0
Hospitals with missing data						
AHA ID	3.6	3.6	0.2	9.7	0.3	6.4
Medicare ID	4.2	11.5	0.2	23.8	0.6	21.7

[a]All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

Table 25

Coefficients and R-Squared Values from Regressions of Hospital Charges on Substance-Abuse Case Mix and Other Variables 1986–1987

Variables	All Hospitals	Hospitals with 5 or More Discharges	All Hospitals Weighted
Ln (case mix)	1.10[a]	.21	0.64[a]
	(0.20)	(0.37)	(.19)
Large urban	0.12	0.12	.082
	(0.07)	(0.10)	(.05)
Rural	-0.16[b]	0.15	-.047
	(0.08)	(0.12)	(.07)
Missing MSA	0.24[b]	0.29[a]	-.07
	(0.11)	(0.10)	(.13)
Ln (1+intern/ bed ratio)	-0.65	-0.78	-1.47[a]
	(0.53)	(0.88)	(.50)
Proportion of short-stay outliers	-1.71[a]	-6.99[a]	-2.04[a]
	(0.10)	(1.85)	(.13)
Proportion of long-stay outliers	1.15[a]	0.64[a]	1.02[a]
	(0.14)	(0.18)	(.11)
Ln (wage index)	0.84[a]	0.40[a]	0.52[a]
	(0.22)	(0.29)	(.17)
R-squared	0.43	0.21	0.40

NOTE: Numbers in table are regression coefficients; numbers in parentheses are standard errors of coefficients.
[a]Coefficient is statistically different from zero at the 0.01 level.
[b]Coefficient is statistically different from zero at the 0.05 level.

charges.[9] If the small-CHAMPUS-volume hospitals (less than five discharges) are excluded from the analysis to reduce the instability in our estimates of hospitals' "true" average costs, the coefficient of the log of the case mix becomes 0.21, a value that is much lower and significantly different from 1.0 (just barely, because the standard error is so much higher).

[9]There is also a nonrandom bias produced by omitting the low discharge hospitals: Hospitals with a small number of cases have charges that tend to be lower than average.

In fact, the situation is more complex than that. The hospitals with five or more discharges in our data set consist of two overlapping, but systematically different, populations. Table 26 compares the average case mix and average charges of specialty hospitals (including those without Medicare data) and general hospitals. Specialty hospitals tend to have both lower case mixes and higher charges than general hospitals. This explains the weak relationship we found between hospitals' case mixes and average charges. An estimate of the relationship between average charge and case mix using the combined population will tend to reduce the "true" positive relationship between the case mix and charges. An estimate of this relationship for only general hospitals is hampered by the small numbers in the analysis, but this imprecise estimate is far higher, 0.62, and, in fact, is insignificantly different from 1.0. The weighted regression also produces results that are worse than those for all hospitals; both the coefficient on the case mix index and the R-squares are lower.

Performing the hospital-level ANOVAs on the full sample of substance-abuse cases reinforces the impact of the differences in charges between hospital types. Including psychiatric specialty hospitals and general hospitals with psychiatric units significantly decreases the homogeneity of the sample, increasing the variation that remains unexplained by the DRG system.

IMPACT ON HOSPITAL REVENUES OF THE DRG-BASED PAYMENT SYSTEM

To analyze the impact on hospitals of extending the DRG system to substance-abuse cases, we first calculated the DRG weights, outlier thresholds, and average standardized amounts. We then simulated the DRG payments for all CHAMPUS patients (including outlier cases) and the additional payments for medical education and capital costs. The DRG classification scheme proposed for CHAMPUS

Table 26

Mean Charges and Case Mix by Hospital Type for CHAMPUS Substance-Abuse Discharges 1986–1987

Hospital Type	Mean Charge ($)	Case Mix
General hospitals	5064	1.43
Specialty hospitals	5931	1.37

substance-abuse cases is based on the 1988 grouper and includes an age break for DRG 435 at 21 years. Our measure of impact is the ratio of total simulated payment to a hospital's billed charges. Using this measure, we are able to evaluate the relative performance of the substance-abuse DRGs compared to the current charge-based system CHAMPUS uses.

As a group, hospitals would have been reimbursed 64 percent of their total charges for substance-abuse cases, plus passthrough payments for medical education and capital costs, if the DRG payment system had been in effect in the period covered by our data. This proportion of total charges is exactly that of the overall DRG payment system. In general, the impact of extending the DRG system to these services on hospitals' total revenues is negligible, because CHAMPUS substance-abuse inpatient days account for only a minute proportion of a provider's total inpatient days (an average of only 0.3 percent of the total).[10]

Table 27 shows the average impact on hospitals with different numbers of CHAMPUS substance-abuse discharges. For hospitals with 10 or fewer discharges, there appears to be a roughly uniform distribution of hospitals between 0.73 and 1.10, with a possible hint of bimodality at the two extremes. Forty-four percent (323 hospitals) would be reimbursed 110 percent of their total charges for substance-

Table 27

Number of Hospitals by Ratio of Reimbursement to Actual Charges and Number of CHAMPUS Substance-Abuse Discharges 1986–1987

Ratio of Reimbursement to Actual Charges	Number of Discharges		
	1–10	11–24	25 or more
More than 1.10	323	2	0
1.00–1.10	32	1	0
0.91–0.99	43	1	0
0.73–0.90	86	14	4
Less than 0.73	205	20	8
All hospitals	689	38	12

NOTE: Hospitals with missing MSA codes are excluded from this table.

[10]This estimate does not include providers with missing Medicare IDs.

abuse cases if the DRG payment system had been in effect in the period covered by our data. On the other hand, 205 low-volume providers (28 percent) would be reimbursed less than 73 percent of their actual total charges. The losers under the DRG system tend to be those hospitals serving a greater volume of CHAMPUS substance-abuse patients. Of the 50 high-volume providers (those with 11 or more discharges), 28 hospitals would suffer a 28 percent or greater loss in revenues.

Table 28 shows dramatic differences in the impact of the DRG system on different hospital types. General hospitals, on average, are "winners," receiving more than 72 percent of their charges; substance-abuse specialty hospitals and hospitals with missing Medicare IDs were "losers." We will discuss some possible explanations for this difference in Sec. 7.

Table 28

Ratio of Reimbursement to Actual Charges for CHAMPUS Substance-Abuse Discharges by Hospital Type 1986–1987

Hospital Type	With Passthroughs	Without Passthroughs
General hospitals		
Nonteaching	0.77	0.68
Minor teaching	0.91	0.81
Major teaching	0.80	0.71
Alcohol/drug hospitals	0.53	0.53
Hospitals with missing data		
AHA ID	0.81	0.75
Medicare ID	—[a]	0.50

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

[a]Information on passthroughs was not available for these hospitals.

5. DRG-BASED PAYMENT FOR PSYCHIATRIC SERVICES IN NONEXEMPT HOSPITALS AND UNITS

The CHAMPUS and Medicare PPSs both initially contained an exemption for psychiatric services. The CHAMPUS exemption, however, differed significantly from that of Medicare. CHAMPUS initially established a broader exemption for these services that covered all inpatient psychiatric services, not just the psychiatric services provided in psychiatric hospitals or in distinct psychiatric units within general hospitals that are exempted by Medicare. Also unlike Medicare, whose payments for exempt services were limited by the Tax Equity and Fiscal Responsibility Act (TEFRA), CHAMPUS paid billed charges for inpatient psychiatric care.[1]

Between FY 1985 and FY 1987 alone, CHAMPUS' total expenditures for psychiatric services increased 47 percent. This rapid rate of increase in CHAMPUS' program costs for psychiatric care was primarily associated with an increase in the charges hospitals bill per day rather than with increases in the length of stay. Such rapid cost increases have fueled demand for an alternative reimbursement method to the current (charge-based) system.

A DRG-based reimbursement system could offer a method of controlling this rise in CHAMPUS expenditures; however, research has shown such a system to have two major shortcomings: DRGs perform poorly in classifying inpatient psychiatric services into relatively homogeneous cost categories, and the DRG system systematically overpays some categories of hospitals and underpays others. Given these shortcomings, OASD(HA) proposed to modify the reimbursement system CHAMPUS currently uses for psychiatric services. First, to align the system more closely to that used by Medicare, CHAMPUS proposed to reimburse general acute-care hospitals

[1]Under TEFRA, hospitals are reimbursed a flat payment per case based on an update of each hospital's average charges since 1982. Hospitals with inpatient operating costs per discharge in excess of the flat payment are paid no more than the target amount. Those hospitals whose inpatient operating costs are less than the target amount keep a percentage of the savings for charges under the payment. These target amounts are adjusted annually. Since 1982, the rates of increase in TEFRA's target amounts have tended to be lower than the rate of increase of hospital input costs. As a result, the rates of increase in Medicare's payments for psychiatric services are much lower than the corresponding rate of increase for CHAMPUS.

without Medicare-exempt "qualifying" units and all other nonexempt facilities through a DRG system.[2] Distinct psychiatric units of general hospitals and psychiatric hospitals were to be excluded from the DRG-based system and, instead, were to be reimbursed using an alternative payment scheme. Reimbursement for these facilities will be discussed in Sec. 6.

In the remainder of this section, we present the results of our analyses of the performance of a DRG-based payment system for the CHAMPUS population. First, we briefly describe the literature on payment for inpatient psychiatric services. Next, we evaluate the ability of the DRG system to classify CHAMPUS psychiatric cases into homogeneous groups with respect to resource use and evaluate whether modifications to Medicare's DRG classification scheme would be needed to reflect the characteristics of the younger CHAMPUS population. Finally, we present the results of our analysis of the financial impact of a DRG-based system for psychiatric services from nonexempt facilities.

REVIEW OF PREVIOUS STUDIES

In October 1983, when Medicare first introduced its new PPS, Congress chose to exempt psychiatric hospitals and "qualifying" psychiatric units of general hospitals from the new system because of the lack of information regarding the financial impact on facilities providing psychiatric services. At the same time that the exemption was granted, Congress also mandated that, by the end of 1985, the HCFA report on the feasibility of using prospective payment for psychiatric services. In response, the National Institute of Mental Health (NIMH) and HCFA, along with a few private associations and other research groups, undertook to develop alternative patient classification schemes to refine or replace altogether the existing psychiatric DRGs.

A number of classification schemes were proposed for grouping psychiatric patients according to differences in resource consumption (Table 29). The proposed schemes represented either refinements of the current DRG-based system or alternative classification schemes using altogether different criteria for grouping patients. The first

[2]Psychiatric cases treated by general acute-care hospitals in "scatter" beds are generally considered to be more homogeneous than the overall population of psychiatric claims, improving the performance of the DRG system. We will assess this assumption.

Table 29

Proposed Classification Systems for Psychiatric Services

Classification Systems	Description
DRGs (HSI 4th Revision)	Nine psychiatric DRGs organized under Major Diagnostic Category 19 (MDC 19); uses principal diagnosis, presence of secondary diagnoses, age, and discharge status.
Case-mix groups (Schumacher et al., 1986)	Thirteen groups based on a combination of psychiatric principal diagnosis, age, transfer status, and presence of psychiatric complications and comorbidities.
Clinically related groups (CRGs) (Mitchell et al., 1987)	Sixteen groupings formed by disaggregating groups and recombining current MDC 19 and 20 DRGs, adjusted for age (under 65 and 65 plus) and presence of secondary medical diagnoses.
Revised CRGs (Morrison et al., 1985)	Ten groupings for MDC 19 only; selective combination of CRGs, age, and exempt or nonexempt unit status.
Disease staging (Mitchell et al., 1987)	Systemetric staging algorithm uses 23 psychiatric disease categories staged on a 0-to-4 point scale for severity of illness.
Patient management categories (PMCs) (Young, 1985)	Eighteen categories for psychiatric conditions; assigns patients to a PMC based on their treatment and diagnostic needs.
Functionally related groups (Leff, et al., 1985)	Classification system designed specifically for mental disorders; incorporates level of functioning as a measure of intensity of resource need.
Severity of illness index (Horn et al., 1985)	Psychiatric Severity of Illness Index scores patients on a 1-to-4 point scale in terms of overall severity of illness based on seven dimensions: stage of principal diagnosis, complications, dependency on hospital staff, rate of response to therapy or rate of recovery, extent of nonoperating-room life-support procedures, concurrent interacting conditions affecting hospital course, and residual impairment.
Alternative DRGs (Taube et al., 1984)	Twenty-two groupings of psychiatric diagnoses based on length of stay; adjusted for age, type of treatment, marital status, legal status, discharge status, prior mental-health care, and referral status.
Alternative classification groups (Morrison et al., 1985)	Twelve groupings for psychiatric diagnoses; combines MDC 19 DRGs into three diagnostic groups, adjusted for age and type of facility.
Psychiatric diagnostic groupings (PDGs) (Ashcraft et al., 1989)	Twelve psychiatric diagnostic groupings, each subdivided into individual psychiatric patient classes (PPCs); used principal diagnosis, count of psychiatric and medical conditions, age, and other behavioral and functional variables.

group of schemes entailed adjusting the existing psychiatric DRGs for characteristics (other than diagnosis) considered to be important predictors of inpatient resource use for psychiatry (e.g., age, prior mental-health treatment, marital status, or referral or legal status). The alternative classification schemes incorporated clinical variables, such as level of functioning, severity of the psychiatric illness, disease stage, or presence or absence of psychiatric or medical complications and comorbidities. Despite the efforts to find a superior reimbursement method, the overwhelming consensus has been that none of the proposed classification systems performs significantly better than the current DRG system in predicting inpatient resource use (Frank and Lave, 1986).

A number of studies have shown that DRGs explain only between 2 and 8 percent of the variation in length of stay or costs for mental-health services (Horgan and Jencks, 1987). Most of the alternative classification schemes explain a similarly small proportion of the total variability in resource consumption (3 to 18 percent), as measured by either length of stay or costs. Of these alternative schemes, those accounting for a higher proportion of the total variability (10 to 18 percent) in resource use appear to do so primarily because they incorporate variables that would be infeasible in a reimbursement system. Overall, the proposed alternative classification schemes are considered by many to represent only a marginal improvement over DRGs (Horgan and Jencks, 1987; Schumacher et al., 1986; Mitchell et al., 1987).[3]

The goal of a classification system for reimbursement is to group patients who are clinically similar and homogeneous with respect to resource consumption. However, within the various psychiatric groupings (for example, DRGs), there is substantial variation in resource use as measured by length of stay (Horgan and Jencks, 1987; Mitchell et al., 1987). The observed combination of large variation within groups and modest average differences between groups is the basis for DRGs' poor performance in classifying psychiatric patients. This pattern seems to hold for the other classification schemes as well. For example, Mitchell et al. (1987) found that the variability within each clinically related grouping (CRG) was as large as that for DRGs.

[3]One classification scheme (Horn's Severity of Illness index) had a reported explained variation of 34 percent. However, because this index uses factors associated with the course of hospitalization to measure severity, this scheme has been criticized as using actual resource use to explain costs, a reimbursement approach that is hardly likely to prove useful (Cretin and Worthman, 1986; Horgan and Jencks, 1987).

These classification systems also fail to explain the substantial differences in costs across different provider types. An analysis of 1981–1982 claims data for a major private insurance carrier found strong differences in the average costs among facility types even after adjusting for differences in case mix (i.e., controlling for the mix of DRGs). Hospital-based substance-abuse units and private psychiatric hospitals had the highest adjusted costs per case, whereas the average costs for general hospitals that treated psychiatric and substance-abuse patients in scatter beds were at least $1000 less than for all other types of facilities (McGuire et al., 1987). These differences may result from a higher degree of differentiation in the mental-health system than in the medical and surgical system. Different types of providers appear to serve different patient populations and to have different approaches to treatment. As an indication of the importance of these differences, Frank and Lave (1986) found that 6.5 percent of general hospitals with psychiatric units would have 30 percent or more of their discharges from these units classified as length-of-stay outliers under a Medicare DRG system. In contrast, only 3.5 percent of all Medicare discharges reimbursed according to DRGs were classified as outliers (Carter, 1987).[4]

In addition, there appear to be strong regional differences in lengths of stay and costs. These regional differences reflect in part the strong state-to-state variation in the organization of the mental-health system—from highly traditional public psychiatric hospital systems to more progressive mental-health systems (Horgan and Jencks, 1987).

CHARACTERISTICS OF CHAMPUS PSYCHIATRIC SERVICES IN NONEXEMPT HOSPITALS AND UNITS

Table 30 indicates that three-quarters of the psychiatric claims to be reimbursed under a DRG system are concentrated in general acute-care hospitals with either no or only minor teaching involvement. Of the remaining nonexempt admissions, the bulk were in hospitals with missing identifiers (AHA and/or Medicare) and therefore could not be classified by provider type.

[4]Estimate based on FY 1985 data and FY 1986 outlier cutoffs. Excludes discharges from New York and Massachusetts that were waivered from Medicare's PPS at the time and from New Jersey and Maryland that continue to be waivered from the Medicare PPS.

Table 30

Distribution of Hospitals and CHAMPUS Psychiatric Discharges by Type of Nonexempt Hospital 1986–1987

Type of Hospital	Hospitals		Discharges	
	Number	%	Number	%
General hospitals				
Nonteaching	638	58.5	2269	51.8
Minor teaching	161	14.8	842	19.2
Major teaching	37	3.4	185	4.2
Specialty hospitals				
Alcohol/drug	2	<1.0	2	<1.0
Children's	5	<1.0	9	<1.0
Hospitals with missing data				
AHA ID	18	1.6	104	2.4
Medicare ID	230	21.1	970	22.1
All hospitals	1091	100.0	4381	100.0

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

Table 31 shows that most of the nonexempt hospitals have a small number of discharges. Approximately 80 percent of nonexempt hospitals had four or fewer CHAMPUS discharges during the 12-month period. However, a relatively small number of providers (9.6 percent) accounted for almost half of all CHAMPUS nonexempt psychiatric admissions.

RESOURCE USE OF CHAMPUS PSYCHIATRIC PATIENTS BY DRG

For the CHAMPUS psychiatric population, an examination of the mean and the variance in either charges or length of stay across DRGs, or the distribution of short-stay and long-stay outliers across DRGs, suggests that the psychiatric DRGs are only partially successful in classifying patients according to their resource use.

Table 32 shows how significant outliers are for some psychiatric DRGs. For each DRG, the distribution of outlier cases and the proportion of the total inpatient days and total charges accounted for by outliers are shown. Overall, 6 percent of psychiatric discharges from

Table 31

Distribution of Hospitals and Psychiatric Discharges by CHAMPUS Volume in Nonexempt Hospitals 1986–1987

Psychiatric Discharges per Hospital	Hospitals		Discharges	
	Number	%	Number	%
1–4	869	79.6	1427	32.6
5–10	118	10.8	785	17.9
11–24	75	6.9	1149	26.2
25 or more	29	2.7	1020	23.3
All hospitals	1091	100.0	4381	100.0

Table 32

Discharges, Inpatient Days, and Charges Classified as Outliers Among CHAMPUS Psychiatric Discharges in Nonexempt Hospitals, by DRG 1986–1987

DRG[a]	Percent of Discharges		Percent of Inpatient Days		Percent of Total Charges	
	Short Stay	Long Stay or Charge	Short Stay	Long Stay or Charge	Short Stay	Long Stay or Charge
425	16.8	2.6	2.5	18.6	4.5	15.1
426	8.5	5.5	0.7	25.2	1.1	23.9
427	12.5	5.8	1.1	24.5	1.7	23.9
428	5.0	10.6	0.3	35.9	0.6	38.0
429	10.5	3.2	0.8	10.9	1.6	9.2
430	5.9	4.8	0.4	17.7	0.7	18.0
431	6.9	13.5	0.4	34.4	0.8	35.9
432	7.3	3.2	0.4	35.6	1.0	34.1

[a]The DRGs are defined as follows: 425, acute adjustment reactions and disturbances of psychosocial dysfunction; 426, depressive neuroses; 427, neuroses except depressive; 428, disorders of personality and impulse control; 429, organic disturbances and mental retardation; 430, psychoses; 431, childhood mental disorders; and 432, other diagnoses of mental disorders.

nonexempt hospitals and units are length-of-stay or charge outliers. Long-stay or charge outliers are particularly concentrated in DRGs 428 and 431. These outliers accounted for approximately 35 percent of the total inpatient days and total charges in these two DRGs. In

contrast, for nonsubstance-abuse, nonpsychiatric CHAMPUS cases from nonexempt providers, only 1.2 percent of the cases were outliers of any kind.[5]

For the CHAMPUS population, Table 33 shows that the DRG system is only somewhat successful in classifying psychiatric patients according to resource use. Some of the differences in the mean length of stay and mean charges across DRG categories are statistically significant and others are not, and the standard deviations for the DRG means are large. Half of the cases fall into one DRG (430), suggesting that DRGs differentiate poorly among CHAMPUS inpatient

Table 33

Nonexempt Hospitals' Charges and Lengths of Stay for CHAMPUS Psychiatric Discharges by 1988 DRGs 1986–1987

	Discharges		Charges ($)		Length of Stay	
DRG	Number	%	Mean	Std. Dev.	Mean	Std. Dev.
With outliers						
425	345	7.9	2596	3193	6.7	9.0
426	986	22.5	3958	4583	11.4	13.3
427	328	7.5	3967	5345	10.9	13.4
428	141	3.2	5432	6165	17.3	18.5
429	95	2.2	4545	3645	12.3	10.1
430	2113	48.2	4555	4572	13.4	12.0
431	318	7.3	6613	6100	21.8	17.8
432	55	1.2	6553	5009	18.5	14.8
Total	4381	100.0	4425	4797	13.0	13.4
Without outliers						
425	336	8.1	2261	1869	5.6	5.0
426	932	22.6	3186	2865	9.0	7.8
427	309	7.5	3204	3180	8.7	8.0
428	126	3.1	3770	3201	12.5	10.1
429	92	2.2	4261	3335	11.3	8.5
430	2011	48.7	3927	3024	11.6	8.3
431	275	6.7	4904	3780	16.6	10.6
432	47	1.1	5054	3642	14.0	10.4
Total	4128	100.0	3650	3064	10.7	8.6

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

[5]Based on the claims sample used to calculate DRG weights and standardized amounts.

stays in terms of resource use (as measured by length of stay or charges). Only approximately 12 percent of the cases fell into the three DRG categories (428, 431, and 432) with the highest mean charges and mean lengths of stay.

In addition, the large differences in the values including and excluding outliers indicate that outlier cases are extremely influential (Table 33). Removal of outlier cases results in substantially lower mean charges and shorter mean lengths of stay for DRGs 428, 431, and 432, suggesting that these three DRGs may be more likely to contain extreme outlier cases than the other categories.

DRG Payment System for Nonexempt Hospitals

The CHAMPUS and Medicare DRG weights for psychiatric services differ significantly (Table 34). For all but one DRG, the CHAMPUS weights are higher, indicating that the CHAMPUS psychiatric

Table 34

Comparison of CHAMPUS and Medicare DRG Weights and Outlier Thresholds for Psychiatric DRGs 1986–1987

	CHAMPUS			Medicare	
		Outlier Threshold[a]			
DRG	DRG Weight[b]	Short Stay	Long Stay	DRG Weight[c]	Long-Stay Outlier Threshold[d]
425	0.586	1	27	0.600	28
426	1.013	1	31	0.658	30
427	0.989	1	30	0.632	29
428	1.267	1	34	0.731	30
429	1.271	1	32	0.887	31
430	1.146	1	33	0.933	33
431	1.557	2	39	0.713	30
432	1.572	1	35	0.710	28

[a]Threshold values are based on the new outlier policy adopted by CHAMPUS on October 1, 1988, calculated for the purposes of this report.

[b]The CHAMPUS weights reported here are those calculated for the purposes of this report.

[c]The Medicare DRG weights are those for FY 1988 taken from Table 5 of *Federal Register*, September 1, 1987.

[d]Threshold values are those for FY 1989 taken from Table 5 of *Federal Register*, September 30, 1988.

discharges in nonexempt hospitals will receive higher payments relative to nonpsychiatric discharges than these discharges would under the Medicare system. One of the reasons for this systematic difference is that the average length of stay for CHAMPUS beneficiaries is systematically longer than for Medicare beneficiaries (Horgan and Jencks, 1987). Another reason for the difference is that most CHAMPUS patients are hospitalized for conditions that, on average, have shorter lengths of stay and are less expensive than Medicare patients. Therefore, relative to all CHAMPUS discharges, psychiatric discharges have long lengths of stay and a higher relative weight. However, because Medicare patients are hospitalized for conditions with long lengths of stay and intense resource use, the relative weight for Medicare psychiatric cases is lower (personal communication, Judith Lave, 1991).

To assess the ability of the DRG classification system to explain the variance in CHAMPUS charges, we carried out an ANOVA. We tested two models: One was the basic DRG classification system with an adjustment for urban or rural location; the second model also included age and gender, which were added to the basic model to assess whether these two variables significantly increase the explanatory ability of the psychiatric DRGs.

Overall, for the nonexempt hospitals, we found that the psychiatric DRGs explained only 5.1 percent of the total variance in charges when outliers are included, similar to the values found for other groups of patients (Table 35). When age and gender were added to the model, the proportion of variance explained increased from 5.1 to 8.1 percent. Although both age and gender were found to be significant predictors of total charges, the coefficient on the gender variable became statistically nonsignificant when outlier cases were excluded.

In addition, we found that, in the basic DRG classification system, provider location was a significant predictor of total charges (Table 35). However, when age and gender were added into the model, only rural location remains significantly different in total charges. These providers' total charges were $1229 less, on average, than the average for providers in other urban locations (the omitted category). In addition, providers that were unclassifiable (due to missing MSA information) had significantly higher total charges than the other urban providers. However, this difference became nonsignificant when outlier

Table 35

Coefficients and R-Squared Values from Regressions of Standardized Charges on Age, Sex, and Psychiatric DRGs 1986–1987

Variables	MODEL 1		MODEL 2	
	With Outliers	Without Outliers	With Outliers	Without Outliers
DRG 425	-3456[a]	-2416[a]	-3604[a]	-2454[a]
	(682)	(464)	(671)	(462)
DRG 426	-2358[a]	-1664[a]	-2678[a]	-1753[a]
	(649)	(444)	(639)	(443)
DRG 427	-2359[a]	-1645[a]	-2926[a]	-1825[a]
	(683)	(465)	(673)	(464)
DRG 428	-950	-1142[b]	-1489[b]	-1310[a]
	(744)	(507)	(734)	(506)
DRG 429	-1836[b]	-624	-1956[b]	-652
	(794)	(533)	(782)	(531)
DRG 430	-1824[a]	-980[b]	-1862[a]	-978[b]
	(639)	(438)	(630)	(437)
DRG 431	-25	-203	-1730[b]	-782
	(684)	(469)	(688)	(477)
Large urban	482[a]	616[a]	310	555[a]
	(164)	(107)	(162)	(107)
Rural	-1365[a]	-759[a]	-1229[a]	-720[a]
	(202)	(130)	(199)	(130)
Missing MSA	892[b]	473	667	397
	(369)	(250)	(364)	(249)
Age dummy	—	—	-1412[a]	-501[a]
(1 if age > 20)			(204)	(137)
Sex dummy	—	—	-1029[a]	316
(1 if female)			(248)	(170)
Age-sex interaction	—	—	-1145[a]	-407
			(337)	(225)
R-Squared	0.051	0.064	0.081	0.073

NOTE: All charges have been standardized for differences in the local wage index and in teaching status. Numbers in table are regression coefficients; numbers in parentheses are standard errors of the estimates. Age and sex were not included as variables in Model 1.

[a]Coefficient is statistically different from zero at the 0.01 level.

[b]Coefficient is statistically different from zero at the 0.05 level.

cases were excluded and when age and gender differences were adjusted for in the model.[6]

CHARGES AND LENGTHS OF STAY BY TYPE OF HOSPITAL

Consistent with other studies, we found substantial differences in charges and lengths of stay between the various types of CHAMPUS providers. Although general acute-care hospitals account for three-quarters of CHAMPUS discharges, Table 36 shows that hospitals with minor teaching responsibility had higher mean charges and longer lengths of stay than the other types of general acute-care hospitals.

The specialty nonexempt hospitals with only a few discharges (two cases in alcohol/drug facilities and nine in children's hospitals) had by far the highest mean charges and longest lengths of stay (Table 36). Those hospitals with missing Medicare data, which we were unable to classify, also had higher mean charges.

Table 36 shows a substantial decrease in mean charges and mean lengths of stay for all provider categories when the outlier cases are removed. The specialty hospitals, in particular, with only a few discharges show a dramatic decrease. Even excluding outlier cases, the nonexempt hospitals with missing Medicare identifiers still have higher mean charges and significantly longer mean lengths of stay than any of the general acute-care hospitals (Table 36).

To assess whether cost differences exist across different types of CHAMPUS providers, we analyzed the distribution of long and short length-of-stay outliers and charge outliers by facility type. For the nonexempt providers, the hospitals with missing Medicare identifiers have the highest proportion of discharges classified as long-stay or charge outliers (Table 37).[7] Among the general acute-care hospitals, those with no or only minor teaching involvement have a somewhat higher proportion of long-stay or charge outliers than the hospitals with major teaching programs.

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[6]When all CHAMPUS psychiatric cases are included in the analyses of variance, the percentage of the total variance in charges explained by the psychiatric DRGs adjusted for urban or rural location decreased slightly from 5.1 to 4.3 percent.

[7]The high proportions for the alcohol/drug and children's facilities are misleading, since these providers have very few discharges.

Table 36

Charges and Lengths of Stay by Hospital Type for CHAMPUS Psychiatric Discharges in Nonexempt Hospitals 1986–1987

Hospital Type	Discharges		Charges ($)		Length of Stay	
	Number	%	Mean	Std. Dev.	Mean	Std. Dev.
With outliers						
General hospitals						
Nonteaching	2268	51.8	3866	4345	10.8	11.7
Minor teaching	842	19.2	4479	4511	13.6	12.5
Major teaching	185	5.2	3241	3521	11.4	11.7
Specialty hospitals						
Alcohol/drug	2	<1.0	10830	5491	36.5	12.0
Children's	9	<1.0	15343	18935	15.1	13.1
Hospitals with missing data						
AHA ID	104	2.4	5140	3969	13.8	11.0
Medicare ID	971	22.2	5717	5588	18.0	16.6
All hospitals	4381	100.0	4425	4797	13.0	13.4
Without outliers						
General hospitals						
Nonteaching	2164	52.4	3218	2712	8.9	7.6
Minor teaching	795	19.3	3754	2972	11.3	8.4
Major teaching	179	4.3	2892	2492	10.0	7.7
Specialty hospitals						
Alcohol/drug	1	<1.0	6947	—	28.0	—
Children's	8	<1.0	9526	7853	12.8	11.8
Hospitals with missing data						
AHA ID	98	2.4	4525	3118	12.0	8.6
Medicare ID	883	21.4	4617	3634	14.3	9.9
All hospitals	4128	100.0	3650	3064	10.7	8.6

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

An ANOVA was performed to examine differences among providers in the ability of a DRG-based system to explain cost variations. Among the nonexempt hospitals, adjusting for provider type substantially increased the percentage of variance explained by the psychiatric

Table 37

Discharges, Inpatient Days, and Charges Classified as Outliers Among CHAMPUS Psychiatric Discharges by Type of Hospital 1986–1987

Hospital Type	Percent of Discharges		Percent of Inpatient Days		Percent of Total Charges	
	Short Stay	Long Stay or Charge	Short Stay	Long Stay or Charge	Short Stay	Long Stay or Charge
General hospitals						
Nonteaching	9.6	4.6	0.9	20.7	1.5	20.6
Minor teaching	7.5	5.6	0.6	20.7	0.9	20.9
Major teaching	8.7	3.2	0.8	15.3	1.1	13.7
Specialty hospitals						
Alcohol/drug	0.0	50.0	0.0	61.6	0.0	67.9
Children's	22.2	11.1	1.5	25.0	7.2	44.8
Hospitals with missing data						
AHA ID	9.6	5.8	0.7	17.6	1.0	17.0
Medicare ID	4.2	9.1	0.3	27.6	0.4	26.6

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

DRGs, from 5.1 to 7.4 percent (Table 38). Of the general acute-care hospitals, the providers with either no or only minor teaching involvement had significantly higher total charges, on average, than the general hospitals with major teaching programs (the omitted category).[8] Also, the estimated coefficients for the unclassifiable providers (missing Medicare or AHA IDs) indicate that these providers have substantially higher total charges, on average, than the general hospitals with major teaching programs. Overall, these results suggest that CHAMPUS providers fall into two or three hospital groupings with respect to average total charges: general acute-care hospitals, specialty hospitals (including the hospitals with missing Medicare or AHA IDs), and children's hospitals.

Table 38 also indicates that, although provider location is significant in explaining the total variability in charges among CHAMPUS pro-

[8]Children's hospitals and the alcohol/drug hospitals had only a few discharges, so these estimates have a larger degree of uncertainty associated with them, making comparisons with those estimates for the other provider types less reliable.

Table 38

Coefficients and R-Squared Values from Regressions of Standardized Charges on Type of Hospital, Age, Sex, and Psychiatric DRGs 1986–1987

Variables	MODEL 1		MODEL 2		MODEL 3	
	With Outliers	Without Outliers	With Outliers	Without Outliers	With Outliers	Without Outliers
DRG 425	-3456[a]	-2416[a]	-3467[a]	-2433[a]	-3583[a]	-2454[a]
	(682)	(464)	(677)	(462)	(669)	(461)
DRG 426	-2358[a]	-1664[a]	-2511[a]	-1795[a]	-2739[a]	-1842[a]
	(649)	(444)	(645)	(443)	(638)	(442)
DRG 427	-2359[a]	-1645[a]	-2508[a]	-1762[a]	-2964[a]	-1876[a]
	(683)	(465)	(678)	(463)	(671)	(463)
DRG 428	-950	-1142[b]	-1078	-1284[b]	-1490[b]	-1381[a]
	(744)	(507)	(739)	(505)	(731)	(504)
DRG 429	-1836[b]	-624	-2035[a]	-777	-2070[a]	-772
	(794)	(533)	(788)	(529)	(779)	(529)
DRG 430	-1824[a]	-980[b]	-1937[a]	-1073[b]	-1921[a]	-1058[b]
	(639)	(438)	(635)	(437)	(628)	(436)
DRG 431	-25	-203	-425	-522	-1788[a]	-882
	(684)	(469)	(681)	(468)	(685)	(476)
Large urban	482[a]	616[a]	315	485[a]	215	457[a]
	(164)	(107)	(165)	(108)	(163)	(108)
Rural	-1365[a]	-759[a]	-1266[a]	-652[a]	-1178[a]	-632[a]
	(202)	(130)	(206)	(133)	(204)	(133)
Missing MSA	892[b]	473	-93	-342	34	-307
	(369)	(250)	(395)	(266)	(390)	(266)
Children's hospital	—	—	11867[a]	6378[a]	10614[b]	6066[a]
			(1581)	(1059)	(1567)	(1060)
Alcohol/drug hospital	—	—	5843	2584	5747	2678
			(3304)	(2966)	(3264)	(2960)
Hospital with missing Medicare ID	—	—	2519[a]	1891[a]	2123[a]	1793[a]
			(379)	(245)	(376)	(246)
Hospital with missing AHA ID	—	—	1977[a]	1638[a]	1925[a]	1643[a]
			(568)	(369)	(561)	(368)
Nonteaching	—	—	1261[a]	822[a]	1286[a]	836[a]
			(359)	(232)	(354)	(231)
Minor teaching	—	—	1488[a]	1098[a]	1473[a]	1102[a]
			(378)	(244)	(373)	(243)
Age dummy (1 if age > 20)	—	—	—	—	-1268[a]	-352[a]
					(205)	(137)
Sex dummy (1 if female)	—	—	—	—	878[a]	200
					(247)	(168)
Age-sex interaction	—	—	—	—	-1029[a]	-330
					(335)	(223)
R-squared	0.051	0.064	0.074	0.091	0.097	0.095

NOTE: All charges have been standardized for differences in the local wage index and in teaching status. Numbers in table are regression coefficients; numbers in parentheses are standard errors of the estimates.

[a]Coefficient is statistically different from zero at the 0.01 level.

[b]Coefficient is statistically different from zero at the 0.05 level.

viders in the basic DRG model, when provider type and age and gender are adjusted for, only rural locale remains an important geographical predictor of total charges among the nonexempt providers.

Age and gender significantly improved the ability of the DRG system to explain differences in resource use among the nonexempt facilities. With these adjustors in the model, the total variability explained increased from 7.4 to 9.7 percent. The coefficient on age indicates that CHAMPUS patients 21 years or older are $1268 less costly to treat, on average, than younger beneficiaries. Also, female beneficiaries were somewhat more costly, on average, to treat than male beneficiaries. However, when outlier cases were removed, the effect of gender became nonsignificant, whereas the coefficient on age remained statistically significant.

PREDICTION OF HOSPITAL-LEVEL RESOURCE USE FOR PSYCHIATRIC SERVICES

To assess how well the DRG system predicts resource use across hospitals, we used a method used by Cotterill et al. (1986) in an analysis of Medicare's overall DRG system. We estimated a regression model of a hospital's total charges for CHAMPUS psychiatric discharges from nonexempt hospitals and then for the psychiatric discharges from hospitals with five or more discharges. As discussed earlier, if the coefficient on the natural log of the case mix is insignificantly different from 1.00, we can conclude that, on average, hospitals are not facing a high level of systematic risk.

For the nonexempt hospitals, we estimated that the coefficient of the case mix was only 0.66, with a standard error of 0.09, suggesting that, on average, the DRG case mix does not adequately reflect differences in resource use at the provider level (Table 39). The model explained 52 percent of the variation in average costs per psychiatric case across all nonexempt providers, suggesting that these providers would face substantial random risk.[9] However, these results may also largely be reflecting the fact that the majority of hospitals have only a few discharges with unstable estimates of the average charge for their psychiatric cases.

Two methods were used to attempt to assess the effect of this skewed distribution of CHAMPUS psychiatric cases: (1) the model was

[9]These estimates are substantially below the 72 percent estimate reported by Cotterill et al. (1986) for the general Medicare population. Cotterill et al.'s estimate was based on their analysis of 1981 MEDPAR data from approximately 5000 hospitals.

Table 39

Coefficients and R-Squared Values from Regressions of Hospital Charges on Psychiatric Case Mix and Other Variables 1986–1987

	Nonexempt Hospitals		
Variables	All	5 or More Discharges	Weighted
Ln (case mix)	0.66[a]	0.53	0.84[a]
	(0.09)	(0.28)	(0.11)
Large urban	0.24[a]	0.07	0.18[a]
	(0.06)	(0.06)	(0.04)
Rural	-0.21[a]	-0.10	-0.24[a]
	(0.06)	(0.08)	(0.05)
Missing MSA	-0.06	0.39	-0.09
	(0.07)	(0.21)	(0.08)
Ln (1 + intern / bed ratio)	0.29	0.43	0.01
	(0.26)	(0.35)	(0.19)
Proportion of short-stay outliers	-1.35[a]	-13.74[a]	-1.60[a]
	(0.08)	(1.53)	(0.11)
Proportion of long-stay outliers	1.56[a]	1.07[a]	1.46[a]
	(0.10)	(0.11)	(0.07)
Ln (wage index)	0.92[a]	0.64[a]	0.58[a]
	(0.19)	(0.21)	(0.13)
R-squared	0.52	0.58	0.54

NOTE: Numbers in table are regression coefficients; numbers in parentheses are standard errors of the coefficients.

[a]Coefficient is statistically different from zero at the 0.01 level.

reestimated for hospitals with five or more discharges; and (2) the regression estimates were weighted with the number of discharges. An analysis based only on hospitals with five or more discharges indicates that if the small-CHAMPUS-volume hospitals are excluded from the analysis to reduce the instability in our estimates, the coefficient of the log of the case mix becomes 0.53, with a standard error of 0.28, not significantly different from 1.0 (at the 5-percent

level).[10] This suggests that other factors differentiate the types of populations in the high-CHAMPUS-volume hospitals, e.g., it may be that those general hospitals with psychiatric units versus those general hospitals without psychiatric units treat a different mix of psychiatric patients.

When the regression estimates are weighted with the number of discharges, a different story appears. In this case, the coefficient on the log of the case mix increases to 0.84, a value much closer to the coefficient of 1.0, suggesting that the DRG system explains differences in resource use at the provider level fairly well. However, the psychiatric DRGs still only accounted for 54 percent of the total variability in resource use across CHAMPUS providers.

IMPACT ON HOSPITAL REVENUES OF DRG PAYMENT SYSTEM

To analyze the financial impact on nonexempt hospitals of extending the DRG system to psychiatric cases from these facilities, we simulated the DRG payments for all CHAMPUS discharges from each nonexempt hospital and compared the total simulated DRG payment with the total charges billed by that hospital. Our measure of impact is the ratio of the total simulated payment to the hospital's billed charges. In this way, we are able to evaluate the performance of a DRG-based system relative to the charge-based system CHAMPUS currently uses for psychiatric services. "Winners" would be those nonexempt providers where the simulated DRG payment exceeds actual charges; "losers" would be those hospitals where the simulated DRG payment would be less than actual charges. Overall, psychiatric cases in the DRG system received 72 percent of their charges, the average for the entire DRG system after passthroughs.

Table 40 shows the average impact of the DRG payment system on low- and high-volume providers. Overall, the hospitals with few CHAMPUS psychiatric discharges (ten or fewer) would fare well under the DRG system, with 59 percent receiving at least 90 percent or more of their actual charges and 28 percent receiving 72 percent or less of their actual charges. The concentration of "losers" under the

[10]There is also a nonrandom bias produced by omitting the low-discharge hospitals: Hospitals with a small number of cases have charges that tend to be lower than on average.

Table 40

Number of Hospitals by Ratio of Reimbursement to Actual Charges and Number of CHAMPUS Psychiatric Discharges 1986–1987

Ratio of Reimbursement to Actual Charges	Number of Discharges		
	1–10	11–24	>24
More than 1.10	418	14	2
1.00–1.10	49	5	3
0.91–0.99	56	6	3
0.73–0.90	111	21	6
Less than 0.73	249	29	15
All hospitals	883	75	29

NOTE: Includes capital and direct teaching passthroughs, where available. Hospitals with missing MSA codes are excluded from this table.

DRG system is greater for the nonexempt hospitals serving a higher volume of CHAMPUS psychiatric patients. Of the 29 hospitals with 25 or more discharges, 15 hospitals would be reimbursed less than 73 percent of their actual charges.

6. PER-DIEM PAYMENT FOR PSYCHIATRIC AND SUBSTANCE-ABUSE SERVICES IN EXEMPT PSYCHIATRIC HOSPITALS AND UNITS

Given the need to contain the explosive rate of growth in the costs of psychiatric services and the fact that a DRG-based system was unlikely to prove suitable for exempt facilities, OASD(HA) decided to investigate a per-diem payment system as an alternative mechanism. Such systems are a promising alternative to a DRG-based payment system because the large variability in length of stay within DRGs is a major source of the variation in the cost unexplained by a DRG-based reimbursement system. Furthermore, a per-diem system for psychiatric services, an area with little clinical consensus, has the advantage of controlling the amount paid per day while leaving the length of stay unconstrained.

It was unclear, however, whether a per-diem system should be based upon the average for a group of hospitals or whether it should be hospital-specific. Each approach has both advantages and disadvantages. An average per-diem system would provide a brake on excessively expensive facilities, but have a substantial financial impact on some providers, given the prevailing large variations in treatment patterns. These variations may partially reflect the substantial degree of uncertainty currently existing regarding the appropriate treatment modes for psychiatric care. Pending a greater degree of consensus on the appropriate treatment, a hospital-specific system would appear to be safer—and, therefore, preferable—since a system based on an average payment rate, rather than a hospital-specific rate, may lead to the elimination of valuable and effective treatment modes. However, it was also clear that any hospital-specific per-diem system developed would have to be modified to overcome two shortcomings:

(1) Excessively expensive hospitals are rewarded by the payment system.

(2) The estimates of hospital-specific rates are statistically unstable when a hospital has too few CHAMPUS psychiatric patients.

Instead, for these low-volume hospitals, an averaged per-diem system may tend to provide a more accurate estimate of costs, leading to relatively small under- or overpayments.

Thus, OASD(HA) requested RAND to develop several variants of a per-diem reimbursement system for CHAMPUS inpatient psychiatric services from exempt facilities that would be hospital-specific for high-volume providers and averaged for low-volume providers. In the remainder of this section,[1] we present a review of per-diem payment systems; an analysis of several alternative per-diem payment systems, all characterized by average per-diem payment rates for low-volume providers and hospital-specific per-diem payment rates for high-volume providers; and an analysis of the financial impact of these payment systems on exempt facilities.

REVIEW OF PREVIOUS STUDIES

Prospective per-diem rates are set prices for a day of an inpatient stay that are independent of diagnosis or treatment costs for a particular episode of hospital care. Although a per-diem system does not put the hospital at risk for variations in length of stay, such a system provides some control over the costs per inpatient day. In addition, a variation on a prospective per-diem system is to include a limit on the number of reimbursable days to further constrain the use of inpatient services.[2]

Setting a fixed price for a day of inpatient care ties the provider's profits to the length of stay. Profitability depends on the relationship between the per-diem rate and the provider's marginal costs (Lave and Frank, 1989). Costs below the per-diem rate provide an incentive to lengthen the stay, while costs above the per-diem rate provide an incentive to shorten the stay. How strong these incentives are depends on how much above or below the per-diem rate the provider's marginal costs actually are. If a limit were set on the number of reimbursable days, the same relationship would obtain up to that limit.

Previous studies have had mixed results on the effect of prospective per-diem rates on hospital length of stay. Studies that have looked at the effects of per-diem rate-setting systems for all inpatient hospital care have found either no effect on length of stay or only a modest increase in length of stay. For example, Worthington and Piro (1982), in their analysis of rate-setting programs in nine states, found that

[1]Analysis of CHAMPUS inpatient psychiatric services from exempt hospitals and units includes both psychiatric and substance-abuse diagnoses.

[2]The limits are usually set as number of days either per inpatient episode or per inpatient care per year.

lengths of stay were 5 percent longer in those states with per-diem rate programs than in states with cost-based reimbursement. Similarly, Coelen and Sullivan's (1981) analysis of the New Jersey SHARE program led them to conclude that per-diem rate setting encourages providers to lengthen stays. On the other hand, Morrissey, Sloan, and Mitchell's (1983) analysis of the effect of state rate-setting programs on hospital cost containment found that length of stay was neither raised nor reduced for providers with mature rate-setting programs between 1968 and 1981.

Lave and Frank (1986, 1988, and 1989) have looked specifically at the effect of prospective per-diem rates on length of stay for inpatient psychiatric services for Medicaid patients. The 1986 analysis was of discharges from psychiatric units within general acute-care medical hospitals. On average, the length of stay was 39 percent shorter in states with a limit on the number of reimbursable days, while prospectively set per-diem rates lead to between 18 and 21 percent longer stays than for states without per-diem rate regulation. In 1988, Lave and Frank extended this analysis by using nonparametric techniques and a more extensive model specification to reexamine the effects. They concluded that limits did reduce the average length of stay for Medicaid by 32 percent; however, state rate setting (which includes per-diem rates) had no influence on length of stay, after controlling for region of the country. These two analyses were based on Medicaid data from the early 1980s.

Lave and Frank's 1989 analysis of supply response to payment structure looked at both prospective per-case and per-diem reimbursement using four more recent (mid-1980s) data sets of Medicaid psychiatric discharges. They found that per-diem rate setting did not significantly affect length of stay, and this result held across all four data sets. As Lave and Frank point out, this finding is consistent with previous work that has suggested that state Medicaid programs set rates that are very close to marginal costs (Ginsberg and Sloan, 1984; Friedman and Pauly, 1983).

CHARACTERISTICS OF CHAMPUS SERVICES IN EXEMPT PSYCHIATRIC HOSPITALS AND UNITS

Of the psychiatric and substance-abuse admissions to exempt facilities, 40 percent were to general acute-care hospitals with either no or only minor teaching involvement (Table 41). Another 57 percent were to psychiatric hospitals, leaving major teaching hospitals with only a minor share.

Table 41

Distribution of Hospitals and CHAMPUS Psychiatric Discharges by Type of Exempt Hospital 1987–1988

Type of Hospital	Hospitals		Discharges	
	Number	%	Number	%
General hospitals				
Nonteaching	257	24.4	2541	25.5
Minor teaching	183	17.3	1464	14.7
Major teaching	61	5.8	237	2.4
Psychiatric hospitals	554	52.5	5724	57.4
All hospitals	1055	100.0	9966	100.0

Table 42 shows that more than half of the exempt providers (i.e., general hospitals with exempt psychiatric units and psychiatric hospitals) had four or fewer psychiatric or substance-abuse discharges. On the other hand, the 21 percent of exempt facilities that had 11 or more discharges accounted for approximately three-quarters of all CHAMPUS discharges.

Table 42

Distribution of Hospitals and Psychiatric Discharges by CHAMPUS Volume in Exempt Hospitals 1987–1988

Discharges per Hospital	Hospitals		Discharges	
	Number	%	Number	%
1–4	614	58.2	1274	12.8
5–10	217	20.6	1502	15.1
11–24	141	13.4	2204	22.1
25–99	72	6.8	3266	32.8
100+	11	1.0	1720	17.2
All hospitals	1055	100.0	9966	100.0

VARIATIONS IN PER-DIEM CHARGES BY PATIENT AND HOSPITAL CHARACTERISTICS

An analysis was first performed to test whether treatment costs[3] vary for patients in different age categories and DRGs. These two specific patient characteristics were chosen because they are thought to influence the costs of treating psychiatric patients. Substantial systematic differences among different types of providers in their patient populations would result in incentives to discriminate against the high-cost patients. This would lead to problems in access for the higher-cost categories and windfall profits to such discriminating hospitals.

Since OASD(HA) proposed to use an average per-diem payment system only for low-volume hospitals, we then estimated the minimum number of patients needed to estimate the per-diem rate reliably. A volume of 25 discharges in the 1987–1988 base year was found to be a reasonable lower limit.[4] Since the data file we used contained only 11 months from the base year, we designated those with under 23 discharges as low-volume hospitals.

Average charges were then compared for different categories of discharges from low-volume exempt facilities, since these hospitals would be paid using average rates. For example, we examined the variability in average charges between different regions and between rural and urban hospitals, as well as in the previously specified patient characteristics.

All Exempt Providers

Table 43 indicates that the average total charges vary substantially across diagnoses, ranging from $3,092 to $10,966. However, the average charge per day is remarkably stable across both the psychiatric and substance-abuse DRGs, suggesting relatively small variations in the intensity of treatment by diagnosis. The per diem for the eight psychiatric DRGs ranges only between $449 and $487.[5] This finding

[3]We actually compared charges, which served as proxies to cost in these analyses.

[4]Twenty-five discharges would provide an estimate of the per-diem rate that was within 10 percent of the "true" value approximately 75 percent of the time.

[5]DRG 424 (Operating room procedure with principal diagnosis of mental illness) is not shown in Table 43. As one might expect, this DRG has a substantially higher per diem. As a result of this difference, DRG 424 (accounting for less than 1 percent of cases) was excluded from the remaining analyses. Horgan and Jencks (1987) have suggested that cases assigned to this DRG probably represent misclassifications, and would be better assigned to DRG 468.

Table 43

Average Total and Per-Diem Charges for CHAMPUS Discharges from Exempt Psychiatric Facilities, by DRG 1987–1988

DRG	Discharges		Total Charges ($)		Per-Diem Charge ($)
	Number	%	Mean	Std. Dev.	
Psychiatric DRGs					
425	233	2.3	4985	5103	459
426	1816	18.2	5997	6217	455
427	569	5.7	6136	6165	487
428	191	1.9	8104	19404	460
429	104	1.0	6659	6172	449
430	4446	44.6	7032	6208	461
431	589	5.9	10966	9433	487
432	72	<1.0	8482	6447	454
Substance-abuse DRGs					
433	112	1.1	3092	2786	440
434	142	1.4	5986	4642	455
435	1383	13.9	7100	5683	410
436	271	2.7	8168	4000	372
437	38	<1.0	7441	3708	316
DRGs 425–437	9966	100.0	6987	6855	451

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

is consistent with previous research findings that psychiatric diagnosis alone seems to be a poor indicator of treatment needs (Frank and Lave, 1986; Schumacher et al., 1986).

There is greater variation in the average per diems for substance-abuse diagnoses, between $316 and $455. However, the extreme values are for DRGs with a relatively small number of discharges and may be due to statistical instability in the estimates for these categories. Most of the substance-abuse discharges (85 percent) fall within a relatively narrow per-diem range ($372 to $410).[6]

The per-diem charges do not vary substantially according to age category (Table 44). Consistent with previous studies, the youngest

[6]DRG 470, not shown here, represents diagnoses that the DRG system cannot classify, and these are excluded from our analyses.

Table 44

Average Total and Per-Diem Charges for CHAMPUS Discharges from Exempt Psychiatric Facilities by Age of Patient 1987–1988

Age of Patient	Number of Discharges	Total Charges ($)		Per-Diem Charges ($)
		Mean	Std. Dev.	
0–20	3493	9096	9229	468
21–40	3437	56^7	4885	443
41–64	2956	6028	4632	433
65 or over	80	5770	4244	446
0–65+	9966	6987	6855	451

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

group (0–20 years) in the CHAMPUS population has substantially higher total charges. However, this difference appears to be almost entirely due to longer stays, because the average per diem for this group is less than 5 percent higher than the average for the entire population.[7] In summary, although total charges vary widely, average per-diem charges are relatively constant across age groups. Average per-diem charges are also relatively constant within the two major diagnostic groupings, i.e., psychiatric and substance abuse. However, there appears to be more variation between the two major diagnostic groupings. Thus, overall, we would not expect a per-diem system to encourage providers to discriminate on the basis of age or diagnosis. However, because of the greater variation between the two diagnostic groupings, we will also examine the implication of having a separate average per-diem system for psychiatric and substance-abuse services. A separate per-diem system would, however, only be important for those hospitals with a strongly disproportionate mix of one type of discharges (e.g., psychiatric) over the other (e.g., substance abuse).[8]

[7]In this regard, the CHAMPUS population appears to differ somewhat from other inpatient psychiatric patients. Schumacher et al. (1986) compared the average per-diem costs and charges across clinical programs in 31 private psychiatric hospitals and found that the pediatric and geriatric programs had higher per-diem costs and mean charges than all other clinical programs.

[8]Hospitals would presumably only have an incentive to discriminate against patient categories with average variable costs higher than the payment rate.

Low-Volume Exempt Providers

We examined the discharges from low-volume hospitals for systematic differences in the charges per day. For low-volume exempt hospitals, the per-diem amounts show a pattern with respect to diagnosis and age similar to that described above for the entire sample. Table 45 shows that the average charge per day ranges from $309 to $447 for the mental-health DRGs. However, the DRGs with the lowest and highest per diems (DRGs 428, 431, and 437) contain less than 10 percent of the total discharges. For the remaining DRGs, the per-diem charges fall within the relatively narrow range of $371 to $442.

Per-diem charges also appear to be relatively constant across age categories for low-volume providers. The average per diem for all

Table 45

Average Total and Per-Diem Charges for CHAMPUS Discharges from Low-Volume Exempt Psychiatric Facilities by DRG 1987–1988

DRG	Discharges		Total Charges ($)		Per-Diem Charges ($)
	Number	%	Mean	Std. Dev.	
Psychiatric DRGs					
425	123	2.8	5075	5632	436
426	592	13.4	5668	6218	427
427	226	5.1	6436	6829	429
428	97	2.2	10357	26403	447
429	48	1.1	6225	5791	381
430	1924	43.6	7069	6857	438
431	270	6.1	11305	10534	443
432	47	1.1	8412	6336	442
Substance-abuse DRGs					
433	55	1.2	3438	3299	442
434	68	1.5	6132	4524	429
435	795	18.0	7105	5759	371
436	128	2.9	7976	4286	372
437	36	<1.0	7213	3677	309
DRGs 425–437	4409	100.0	7104	7791	419

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

ages combined is less than 5 percent lower than the average per diem for the highest group, the 0–20 age group (Table 46).

Table 47 shows the relationship between average charges per day and length of stay (see Fig. 1 for a graph of the same data).[9] For these hospitals, Table 47 indicates that the average charges per day for stays lasting only a few days are higher than for longer stays, a result consistent with previous findings (Frank and Lave, 1986). One-day stays have the highest average charge, approximately $593. The average charge then falls rapidly and begins to even out with stays of five days or longer, becoming roughly constant for stays of 12 days or more. One possible interpretation of this pattern is that the first day is more costly, while the patient undergoes testing; then, costs level off rapidly as a treatment regime is implemented.

For these hospitals, we also looked for systematic differences in the per-diem charge by the urban or rural location and the regional location of the hospital. We did not find major differences by urban or rural location (Table 48). CHAMPUS discharges from urban provid-

Table 46

Average Total and Per-Diem Charges for CHAMPUS Discharges from Low-Volume Exempt Psychiatric Facilities, by Age of Patient 1987–1988

	Discharges		Total Charges ($)		
Age of Patient	Number	%	Mean	Std. Dev.	Per-Diem Charges ($)
0–20	1478	33.9	9808	11067	437
21–40	1440	33.0	5594	5136	408
41–64	1442	33.1	5872	4660	402
0–64	4360	100.0	7104	7791	419

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

[9]Hospitals would have an incentive to lengthen a patient's stay if hospitals were paid on a per-diem basis as long as the daily payment exceeds the cost of an additional day of care. If costs decrease during the course of a stay, then, ideally, so should payments.

Table 47

Average Charges per Day by Length of Stay, Low-Volume Exempt Psychiatric Facilities 1987–1988

Length of Stay (Days)	Number of Discharges	Average Charges Per Day ($)
1	243	593
2	218	518
3	235	530
4	197	489
5	193	479
6	179	451
7	175	453
8	169	474
9	139	479
10	150	444
11	122	507
12	125	454
13	132	450
14	130	423
15	113	398
16	75	433
17	88	415
18	90	417
19	86	395
20	94	380
21	129	370
22	70	405
23	65	420
24	60	410
25	65	390
26	53	373
27	97	408
28	153	370
29	129	403
≥30	635	417

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

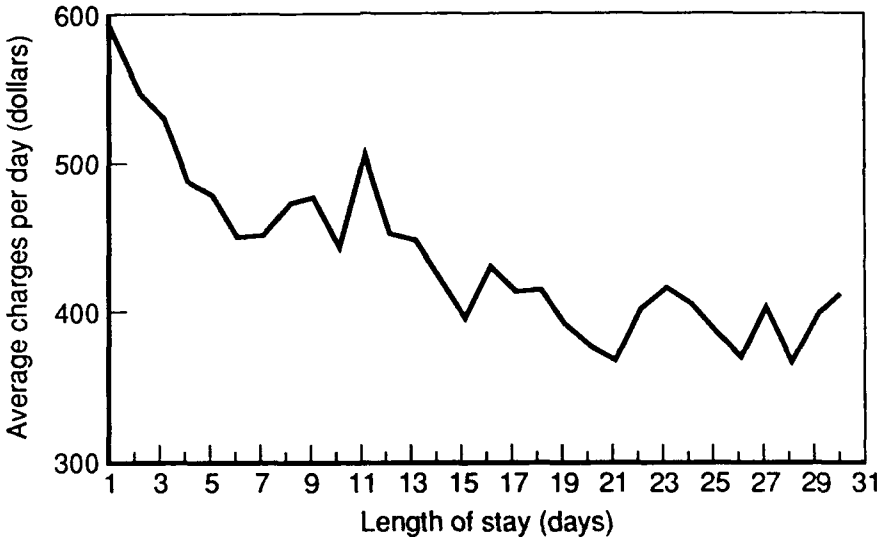

Fig. 1—Average charge per day by length of stay: low-volume exempt hospitals

ers have average per-diem charges that are slightly higher than those for rural providers.[10]

We found somewhat greater variation in average per-diem charges across regions of the country, as defined by the nine Census regions (Table 49). Per-diem charges range from $478 in the Middle Atlantic States to as low as $336 in the West North Central States.[11] The regional differences are not only somewhat larger than the ones found previously for age and DRG, but also have a greater effect on the overall financial impact of the payment system. Differences in the per-diem rate by region have greater revenue effects than the differences by age or diagnosis, because hospitals tend to provide services

[10]The provider locations that were unclassifiable because of missing data primarily appear to be urban hospitals. They had the highest per-diem charge of $449, but their per diems are unadjusted for the local wage index. Their adjusted per diems are likely to fall within the range for urban hospitals.

[11]Lengths of stay for CHAMPUS beneficiaries being treated in exempt facilities range from 13 days in the Pacific States to a high of 18 days in the East North Central and East South Central States. This finding is not surprising given the well-documented strong regional differences in lengths of stay and costs for inpatient psychiatric care (Horgan and Jencks, 1987).

Table 48

Average Charges and Per Diems by Location, Low-Volume Exempt Psychiatric Facilities 1987–1988

Location	Discharges		Total Charges ($)		Per-Diem Charges ($)
	Number	%	Mean	Std. Dev.	
Large urban	1257	28.5	6732	6832	410
Other urban	1520	34.5	6363	8864	405
Rural	512	11.6	5620	5567	397
Missing	1120	25.4	9205	7720	449
All locations	4409	100.0	7104	7791	419

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

Table 49

Average Charges and Per Diems by Geographic Region, Low-Volume Exempt Psychiatric Facilities 1987–1988

Region	Discharges		Total Charges ($)		Per-Diem Charges ($)
	Number	%	Mean	Std. Dev.	
E.N. Central	615	14.0	7841	8740	403
E.S. Central	568	12.9	8623	12385	449
Mid-Atlantic	239	5.4	7859	8349	478
Mountain	373	8.5	7800	7453	425
New England	207	4.7	7480	7699	411
Pacific	693	15.7	5680	5401	441
S. Atlantic	1023	23.2	6779	6260	412
W.N. Central	328	7.4	5514	4634	336
W.S. Central	363	8.2	7119	5911	420
All regions	4409	100.0	7104	7791	419

NOTE: All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

to more than one age group or DRG but operate only in a single region. The differences in daily charges by diagnosis or age will tend to average out across patients in a hospital, but regional variations affect all patients in a given hospital.

IMPACT ON HOSPITAL REVENUES OF PER-DIEM PAYMENT SYSTEM

We simulated the per-diem payments for all CHAMPUS discharges from each hospital and compared the total simulated DRG payment with the total charges billed by that hospital. This was done using the average regional rates for hospitals with fewer than 25 discharges annually (fewer than 23 in our 11-month file) and hospital-specific per-diem rates for hospitals with 25 or more discharges (23 or more in our 11-month file). This identified the provider types that would probably be substantial "winners" or "losers" under a CHAMPUS per-diem payment system.

For providers with under 23 CHAMPUS discharges in our file, we calculated the per-diem rates for three different per-diem systems: an average per-diem system; a first-day, subsequent-day per-diem system; and a separate average-per-diem system for psychiatric and substance-abuse services (Table 50).[12] For the average per-diem system, we calculated the per-diem rates for each of the nine regions as the average charge per day. For the first-day, subsequent-day per-diem system, we calculated the first-day payment as the average charge per discharge for all one-day lengths of stay, since there are not enough one-day stays in most regions to ensure statistical stability in the calculated rate. We calculated the first-day payment to be $593. The per-diem rates for subsequent days were calculated for each of the nine regions as the average charge per day (less the first day of the hospital stay). Both the average per-diem rates and the first-day, subsequent-day per-diem rates are standardized for differences in the hospital-specific wage index and for indirect teaching costs.[13]

For the hospital-specific per-diem system, we calculated a single per-diem rate for each hospital, equal to the hospital's average charge per

[12]The per-diem charges reported in Table 49 are greater than those reported for the average rate under Table 50. In Table 49, the per-diem charges include an average capital passthrough and a hospital-specific direct medical education passthrough. The per-diem charges reported in Table 49 are the average per diem less the average direct medical education passthrough (which will later be given back to the hospitals in the impact analysis). Thus, although we are reporting the average per-diem amounts to be those listed in Table 50, the hospitals would actually receive the per-diem charges listed in Table 49.

[13]Our analysis indicated that the average capital costs for general and specialty hospitals differ systematically and substantially. General hospitals have significantly higher capital costs per day. The variation in average capital costs was relatively small within each group. We therefore estimated the averages separately for each group of hospitals. Given the substantial costs involved in filing a cost report, OASD(HA) decided to include the average capital passthrough in the per-diem payment, with general hospitals and psychiatric specialty hospitals each receiving the average for their group.

Table 50

Per-Diem Rates by Geographic Region for Providers with Fewer Than 25 Discharges Annually: Comparison of Different Per-Diem Systems 1987–1988

Region	Average Rate ($)	First-Day/ Subsequent-Day Rate[a] ($)	Separate Psychiatric Rate ($)	Separate Substance-Abuse Rate ($)
E.N. Central	399	389	417	317
E.S. Central	448	440	470	405
Mid-Atlantic	475	468	488	393
Mountain	425	415	459	376
New England	409	398	422	350
Pacific	439	426	458	377
S. Atlantic	409	398	423	382
W.N. Central	332	315	351	259
W.S. Central	419	408	426	397
All regions	417	406	399	434

[a]First-day payment = $593 for each region. The individual region rates reported in the table exclude the first day. All charges have been standardized for differences in indirect teaching costs and in the local area wage index.

day for all CHAMPUS payments, after removing all claims with a per diem that was more than two standard deviations away from the mean of the distribution of the logarithm of the per diem. This rate was then capped at the 80th percentile of per-diem charges ($629) for all CHAMPUS discharges covered by the hospital-specific system.[14] Table 51 shows the estimated financial impact of an average per-diem system; a first-day, subsequent-day per-diem system; and a hospital-specific per-diem system. Overall, the hospitals with few CHAMPUS discharges would fare well under the average per-diem system with 68 percent receiving at least 90 percent or more of their actual charges. The major exceptions are the 114 hospitals (12 percent) that would receive less than 72 percent of their actual charges. Table 51 also indicates that using separate average per diem rates for psychiatric and substance-abuse services would not have a substantial financial impact on hospitals in each of the nine regions.

[14]CHAMPUS professional payments are similarly capped at the 80th percentile.

Table 51

Impact of a Per-Diem Payment System: Number of Psychiatric Facilities by Ratio of Reimbursement to Actual Charges and by Number of Discharges 1987–1988

Ratio of Reimbursement to Actual Charges	Hospitals with 24 Discharges or Fewer Per Year[a]			Hospitals With[b]	
	Average Rate	First/Subseq. Day Rates	Separate Psych/SA Rates[c]	25–50 per Year	More than 50 per Year
More than 1.10	403	432	422	0	0
1.00–1.10	124	128	100	49	43
0.91–0.99	105	92	110	1	6
0.73–0.90	193	181	195	4	8
Less than 0.73	114	106	112	3	2

[a]Simulated reimbursement based on average per-diem payment.
[b]Simulated reimbursement based on hospital-specific per-diem payment.
[c]Separate psychiatric and substance-abuse rates are based on 11 months of data.

Under the hospital-specific per-diem system, most hospitals would be paid their total charges in the base year. The hospital-specific per-diem rates would be capped at $629 for 25 providers, the 80th percentile of all hospital-specific per-diem charges. Under this system, therefore, hospitals serving a greater volume of CHAMPUS patients would have been relatively unaffected in the base year.

7. IMPLICATIONS

The payment systems described in this report represent a departure from previous CHAMPUS practice of paying billed charges for inpatient services. In two of the areas covered, children's hospitals and psychiatric services, CHAMPUS, with an urgent need to find an alternative to paying billed charges, has departed from Medicare's current reimbursement approach. We encourage CHAMPUS to monitor hospital response to the new payment systems.

We have presented estimates of the financial impact of prospective payment. We evaluated a DRG-based payment system for children's hospitals and for substance-abuse and psychiatric services in nonexempt hospitals. We also evaluated a per-diem system for services in exempt psychiatric hospitals and units. We stress that these estimates assume that admission and discharge patterns are not altered by the change to prospective payment. If hospitals respond to the incentives of DRG or per-diem payment, the actual impact could differ substantially from our estimates.

Research on the Medicare PPS has shown that hospitals may change their coding practices to shift cases from DRGs with lower payment rates to ones with higher payment rates, that patients tend to be discharged sooner, and that some cases may be shifted from inpatient to outpatient settings (Carter and Ginsburg, 1985). Hospitals are likely to respond less dramatically to the CHAMPUS DRG system. Most hospitals are likely to have adjusted previously to the Medicare system by altering their practices for all patients, not just Medicare patients. Furthermore, even if the response to Medicare did not affect other patients, the vast majority of hospitals have too low a CHAMPUS volume to warrant efforts to tailor practices to the new payment rules.

Since the new payment systems for previously exempt services differ in structure and generosity, they provide different incentives to the hospitals that provide these services to CHAMPUS beneficiaries. The implications for each type of service are discussed more fully below. In general, DRG payment systems provide incentives to shorten stays and avoid unnecessary treatments. Research on Medicare's longer experience with DRG payment shows that patients are sicker at admission and that patients are sicker and less stable at discharge (Rogers et al., 1990). During the same period, the hospital process of

care improved and in-hospital mortality decreased. However, the increase in problems at discharge has raised death rates for the patients studied.

Substance-abuse hospitals in particular may be encouraged to change their practices in response to CHAMPUS DRG payments, because the system does not offer the cushion of high payment levels that is built into children's hospital payments. The relatively generous per-diem system for psychiatric hospitals and units contains incentives to lower the level of service per day but could encourage longer stays if the per-diem rates exceed the hospitals' costs per additional day.

Finally, for all three types of service, we observed that hospitals providing a high volume of CHAMPUS care would consistently be reimbursed for a smaller proportion of their charges under a PPS than those providing a low volume. We cannot explain the sources of these differences. However, if these differences reflect inefficiency or inappropriate treatment patterns, they should not be reflected in the payment system.

IMPLICATIONS OF A DRG PAYMENT SYSTEM FOR CHILDREN'S HOSPITALS

The DRG payment system that we simulated for children's hospitals is, on average, considerably more generous than the system CHAMPUS adopted for nonexempt hospitals. It recognizes the higher cost of providing care in children's hospitals through a separate and higher standardized amount (the children's hospital payment differential) and confers a special status on children's hospitals by implementing a revenue-neutral policy. The differential is based on two premises: (1) As regional referral centers, children's hospitals treat the more seriously ill pediatric patients within DRGs, and (2) unlike hospitals that treat both children and adults, children's hospitals cannot shift the higher treatment costs of pediatric patients to adult patients. The outlier policy was also made more generous by combining the lower thresholds for identifying long-stay and high-cost patients under the old policy with the 80-percent payment level for cost outliers under the new policy. Finally, Congress directed that the payment system be revenue-neutral in FY 1989.

Despite the payment differential that substantially increased the children's hospital standardized amount for FY 1989 and a more generous outlier policy, a few hospitals with large CHAMPUS volume may lose substantial revenue under a DRG payment system. For this

reason, CHAMPUS is considering a phase-in using hospital-specific standardized amounts for three years for children's hospitals with 50 or more CHAMPUS discharges in the base year.[1] These standardized amounts would be estimated to produce revenue neutrality in the base year.

The policies adopted for children's hospitals should afford significantly greater protection against adverse impacts in the future. Although the costs of pediatric care, like other types of inpatient care, are highly variable, the higher payment levels and more generous treatment of cost outliers should limit losses.

IMPLICATIONS OF A DRG PAYMENT SYSTEM FOR SUBSTANCE-ABUSE SERVICES IN NONEXEMPT FACILITIES

Several factors must be considered in assessing a reimbursement system. Gaining control over hospital costs was clearly a crucial factor in CHAMPUS' decision to extend its DRG PPS to substance-abuse services. Another was to encourage provider efficiency. Extending the DRG system achieves these two objectives. Two other major concerns also had to be addressed: (1) whether the reimbursement system ignored important differences between patients that might impede their access to needed services and (2) whether the reimbursement system would impose inequitable losses on some hospital types.

With only one exception, our study did not find any patient characteristic categorization system that improved significantly upon the DRG system. We did find that there was a substantial difference in charges between those patients older and younger than 21 years of age who were classified in DRG 435. DRG 435 was split into two separate categories to reflect this difference to ensure the continued access of patients under 21 who need detoxification services.

Assessing the equity of the payment system was far more difficult. A payment system may not be equitable if a type of hospital treats a patient population requiring more costly treatments on average and if the payment system does not recognize this. An optimal payment system would recognize this difference but would reimburse only for the costs of a "reasonably" efficient provider. Unfortunately, it is

[1]Appendix A contains an analysis of the number of discharges needed for statistically stable estimates.

rarely possible to distinguish differences in patient mix or legitimate differences in treatment approaches from differences in efficiency.

In fact, these differences between different types of providers may be more apparent than real. CHAMPUS claims records report that only 18 percent of substance-abuse patients receive rehabilitation services. It is possible that rehabilitation is provided for more patients, but the hospitals have not bothered to record rehabilitation procedure codes on the claims forms. If so, coding practices should change with DRGs, and the relative frequency of DRG 437, Combined Detoxification and Rehabilitation Therapy, should increase. The CHAMPUS weight for DRG 437 is approximately 27 percent higher than the weights for DRG 435.21, where no rehabilitation services are provided.[2] The difference would increase somewhat in future recalibrations if the data we used to calculate the current weights underreported rehabilitation services. Therefore, if specialty hospitals are in fact delivering more rehabilitation than they have been reporting, their revenues under DRGs would tend to be higher than our estimates suggest.

If the longer stays are not a result of unreported rehabilitation, they may reflect either other treatment differences or differences in the appropriateness of discharge timing. Without the simple solution offered by more careful coding, some of the hospitals that previously treated CHAMPUS patients might try to decrease their CHAMPUS volume or cut back (appropriately or inappropriately) on the services they offer these patients. For these reasons, we believe that CHAMPUS should monitor the actual impact of substance-abuse DRGs on the number of admissions (particularly readmissions) and lengths of stay in different types of hospitals.

IMPLICATIONS OF A DRG PAYMENT SYSTEM FOR PSYCHIATRIC SERVICES IN NONEXEMPT FACILITIES

Like Medicare, CHAMPUS will reimburse for psychiatric services provided outside of exempt hospitals and units using the existing DRG system. On average, the providers of psychiatric services in these nonexempt facilities will do as well as other hospitals do under the CHAMPUS DRG system. The incentives for these services are then similar to those for the others covered by the DRG system. However, given the absence of consensus regarding the definition of appropriate treatment for psychiatric services, CHAMPUS should

[2]Should such a shift be observed, it may be advisable to split DRG 437 with the same age split as DRG 435.

monitor the quality of the psychiatric services provided by the nonexempt facilities.

IMPLICATIONS OF A PER-DIEM PAYMENT SYSTEM FOR SERVICES IN EXEMPT PSYCHIATRIC FACILITIES

Despite several years of research, Medicare has been unsuccessful in developing a DRG-based payment system for psychiatric care. Medicare uses a cost-based reimbursement system for psychiatric care and can limit the rate increase in costs it will reimburse. CHAMPUS, however, has been paying billed charges. Faced with rapidly rising costs for psychiatric care and with psychiatric cases accounting for more than 7 percent of all admissions, CHAMPUS needed a mechanism for controlling future cost increases. Without a better understanding of the reasons for the large variation in length of stay, CHAMPUS elected to pursue a system that pays prospectively for each inpatient day, rather than paying per case.

Under the combined system of hospital-specific per-diem rates for large-volume CHAMPUS providers and regional per-diem rates for small-volume providers, the losses suffered by any single provider should be low. Hospitals with 25 or more discharges annually will be paid a rate based on their average per-diem charges for CHAMPUS patients, estimated at FY 1988 levels and capped at the 80th percentile. They will lose money only if their estimated rate departs from their true rate or if their costs increase rapidly in the future. The other hospitals will also lose money if their charges exceed the average for their region. However, revenue neutrality and the structure of the per-diem system make it likely that these providers will fare substantially better than hospitals under the existing CHAMPUS DRG system.

Our analysis of the average charges for psychiatric stays of varying lengths suggests that patients incur higher charges for the first day than for subsequent days. However, CHAMPUS elected not to add the complication of a two-part per-diem system. The constant per-diem structure implemented almost certainly overpays providers for added days of care. Since the CHAMPUS program contains generous coverage for inpatient psychiatric care and does not review utilization (except for stays over 30 days), constant per diems may lead to longer stays. We recommend that CHAMPUS evaluate the impact of the per-diem payment system to guard against increasing program costs.

INCORPORATION OF EXEMPT SERVICES IN CHAMPUS PPS

By March 1989, all of the exempt services discussed in this report had been incorporated into the CHAMPUS PPS. The research described here, initiated in 1987 and completed in 1989, supported the development of these changes. In October 1988, CHAMPUS began using a modified version of DRGs as the basis for reimbursing for CHAMPUS substance-abuse and psychiatric services in nonexempt hospitals and units. In January 1989, CHAMPUS began using a per-diem payment system to reimburse for CHAMPUS substance-abuse and psychiatric services in exempt psychiatric hospitals and exempt psychiatric units within hospitals. In March 1989, CHAMPUS began reimbursing children's hospitals for CHAMPUS patients using existing DRGs, but based on a higher standardized amount (called "the children's hospital differential") and a more generous outlier policy than reimbursements to nonexempt hospitals.

Appendix A

PM-DRG-BASED PAYMENT FOR CHAMPUS PATIENTS IN CHILDREN'S HOSPITALS: NUMERICAL RESULTS

To evaluate the financial impact of using PM-DRGs, we simulated the distribution of outliers and reimbursement payments based on this alternative classification system. Tables A.1, A.2, and A.3 show the results of this analysis. These results are also summarized at the end of Sec. 3.

Table A.1

Discharges, Patient Days, and Charges Classified as Outliers for Pediatric Patients in Children's Hospitals and Nonexempt Hospitals Under the New Outlier Policy for PM-DRGs[a] 1986–1987

		Children's Hospitals[b]		Nonexempt Hospitals[c]	
	Outlier Category	Number	%	Number	%
I.	Number of discharges				
	Short stay	1111	26.8	7275	28.1
	Long stay	49	1.2	247	1.0
	Cost	25	0.6	38	0.1
II.	Number of patient days				
	Short stay	1117	6.3	7310	7.6
	Long stay	1005	5.7	6983	7.3
	Cost	540	3.0	1293	1.3
III.	Charges ($)				
	Short stay	1,748,639	8.9	8,112,744	11.5
	Long stay	997,049	5.1	4,294,898	6.1
	Cost	1,678,026	8.6	2,778,949	4.0

[a]All data exclude individuals under 29 days of age, DRGs related to pregnancy and childbirth, neonatal DRGs, psychiatric DRGs, substance-abuse DRGs, bone-marrow transplants, and cystic fibrosis.
[b]Data for 4,141 patients.
[c]Data for 25,901 patients.

Table A.2

Difference Between DRG Reimbursement and Actual Charges by Teaching Status and CHAMPUS Volume in Children's Hospitals and Nonexempt Hospitals, Under the New Outlier Policy for PM-DRGs[a] 1986–1987

	Children's Hospitals[b]			Nonexempt Hospitals[c]
	New	Old	Combined	New
Teaching status				
Nonteaching	-4.8	-5.3	-5.6	-26.8
Minor teaching	7.1	8.7	8.4	-27.6
Major teaching	5.1	5.0	5.8	-25.4
Number of CHAMPUS pediatric discharges				
1–24	0.7	5.2	6.0	-25.5
25–99	-1.5	-0.5	-0.2	-29.0
100 or more	1.1	0.0	-0.3	-25.0
All hospitals	0.0	0.0	0.0	-26.7

[a]All data exclude individuals under 29 days of age and DRGs related to pregnancy and childbirth, neonatal DRGs, psychiatric DRGs, substance-abuse DRGs, bone-marrow transplants, and cystic fibrosis.

[b]Data for 4,141 patients.

[c]Data for 24,535 patients. Also excluded are 1,366 claims from hospitals with incomplete information on capital and medical education expenditures.

Table A.3

Number of Children's Hospitals by Ratio of Reimbursement to Charges and Number of CHAMPUS Pediatric Discharges Under Three Outlier Policies for PM-DRGs 1986–1987

	Ratio of Reimbursement to Charges	Number of CHAMPUS Pediatric Discharges			
		1–24	25–99	100 or more	Total
I.	New outlier policy				
	More than 1.1	8	13	3	24
	0.9–1.1	1	7	4	12
	0.75–0.89	3	3	2	8
	0.65–0.74	1	3	0	4
	Less than 0.65	1	0	0	1
II.	Old outlier policy				
	More than 1.1	8	13	3	24
	0.9–1.1	3	8	4	15
	0.75–0.89	1	4	2	7
	0.65–0.74	2	1	0	3
	Less than 0.65	0	0	0	0
III.	"Combined" outlier policy				
	More than 1.1	8	13	3	24
	0.9–1.1	3	7	4	14
	0.75–0.89	2	6	2	10
	0.65–0.74	0	0	0	0
	Less than 0.65	1	0	0	1
	Total	14	26	9	49

Appendix B

SAMPLE SIZE FOR ESTIMATE OF HOSPITAL-SPECIFIC PAYMENT LEVELS FOR CHILDREN'S HOSPITALS

For the children's hospitals within the CHAMPUS claims file, we wanted to know with various degrees of confidence approximately how many pediatric cases a particular hospital should see before the estimated mean charge per case would stabilize to within 10 or 20 percent of the actual value.

Data were available for 41 hospitals, of which six had fewer than ten pediatric cases and were arbitrarily excluded from the analysis because their estimates of charge means and standard deviations were likely to be unreliable. The remaining hospitals had from 11 to 1011 cases. A parallel analysis was done on the 31 hospitals remaining after cost and stay outliers had been removed. The range of cases in these hospitals after excluding outliers was from 11 to 706; in fact, approximately 30 percent of CHAMPUS cases in children's hospitals qualified as cost or stay outliers.

As a methodological note, all pediatric cases for each hospital were grouped together regardless of DRG, so that means and standard deviations of charges were computed across DRGs. It was assumed that, in grouping all pediatric cases together, the variability of charges within DRGs would significantly outweigh the variability of charges across DRGs. In other words, DRG groupings do not explain much of the charge variability. Consequently, stratification of the data by DRGs would only slightly change the mean and standard deviation estimates and thus only slightly affect the minimum sample size calculations. To compensate for the difference in DRG case mixes at different hospitals, mean per-case charges were divided by the case-mix factor. The charge standard deviations were not similarly divided because variability across DRGs was assumed to be small compared to variability within DRGs.

For each hospital, standard minimum sample size calculations were performed at four different confidence levels (80, 90, 95, and 99 percent) and for two degrees of precision (within 10 or 20 percent of the estimated mean charge). The formula computed n = square of (z ×

s.d./c × mean), where c was either 0.10 or 0.20, and z was the appropriate upper quantile from N(0,1). These calculations gave, for a given confidence level, a different minimum sample size necessary for an individual hospital to achieve the same relative stability in its estimate of the mean charge per case.

Since an overall across-the-board cutoff was desired for the number of cases needed to enable reimbursement of charges at hospital-specific rates, the following somewhat ad hoc procedures were devised to combine the various hospital estimates. At each confidence level, weighted averages of the hospital-specific minimum sample sizes were computed with weights based on the number of cases each hospital had reported. The weights equalled the number of cases in each hospital, divided by the total number of cases in all children's hospitals. Those hospitals reporting more cases were assumed to have more stable estimates of the mean and standard deviation of charges.

The results of these calculations are shown in Figs. B.1 and B.2. To ensure stability of the mean charge estimates within 10 percent of the true average, we would want at least 200 cases when cost and stay outliers are included (Fig. B.1) and probably at least 150 cases when such outliers are removed (Fig. B.2). Such minimum levels would roughly inspire 80-percent confidence in the estimated mean charges; for 95-percent confidence, one would like at least 500 cases per hospital when outliers are included (Fig. B.1) and at least 350 cases per hospital when they are not (Fig. B.2). To ensure stability of the mean charge estimates within 20 percent of the true average, the sample size calculations are significantly different. Cutting the precision of the estimates by one half has the effect of reducing the necessary minimum sample sizes by three-fourths. Still at a 95-percent confidence level, one would want over 130 cases per hospital if outliers are not excluded (Fig. B.1), and over 90 cases if outliers are excluded (Fig. B.2). Thirty-five of 41 children's hospitals (85 percent) did not meet either of these criteria.

As a basis for comparison, we also charted the minimum necessary sample sizes over the set of hospitals to estimate *median* charges (Figs. B.3 and B.4). Half the children's hospitals analyzed would require over 140 cases to achieve the desired stability at the 80-percent confidence level (with or without outliers), and half would require over 340 cases at the 95-percent confidence level (Figs. B.3 and B.4). However, only four out of 41 children's hospitals (9.8 percent) reported more than 140 CHAMPUS cases and only three (7.3 percent) reported more than 340 cases.

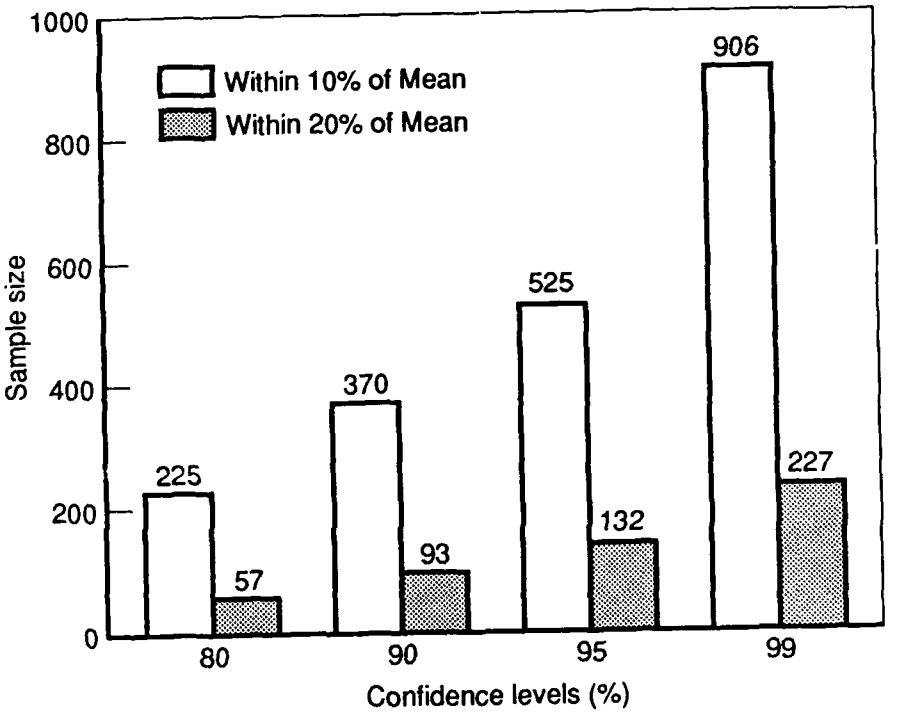

Fig. B.1—Minimum sample size per children's hospital based on weighted average of hospital-specific estimates: outliers included

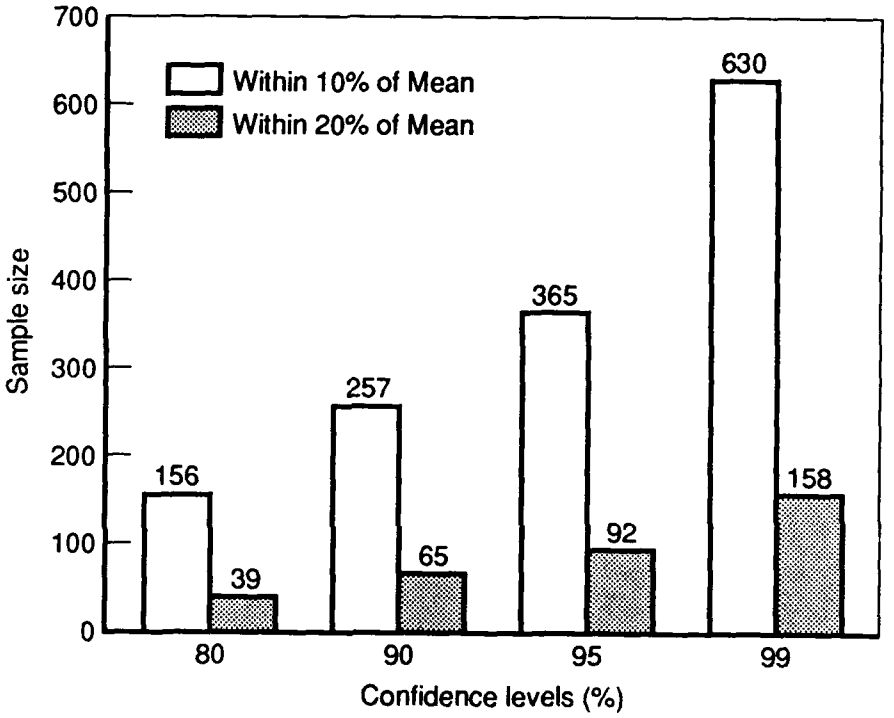

Fig. B.2—Minimum sample size per children's hospital based on weighted average of hospital-specific estimates: outliers excluded

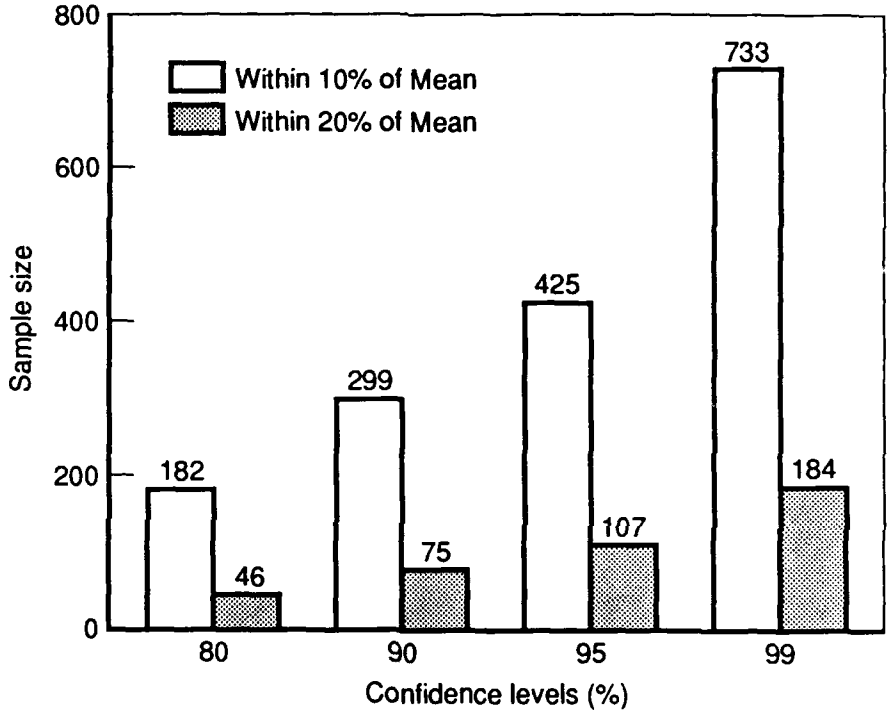

Fig. B.3—Minimum sample size per children's hospital based on median of hospital-specific estimates: outliers included

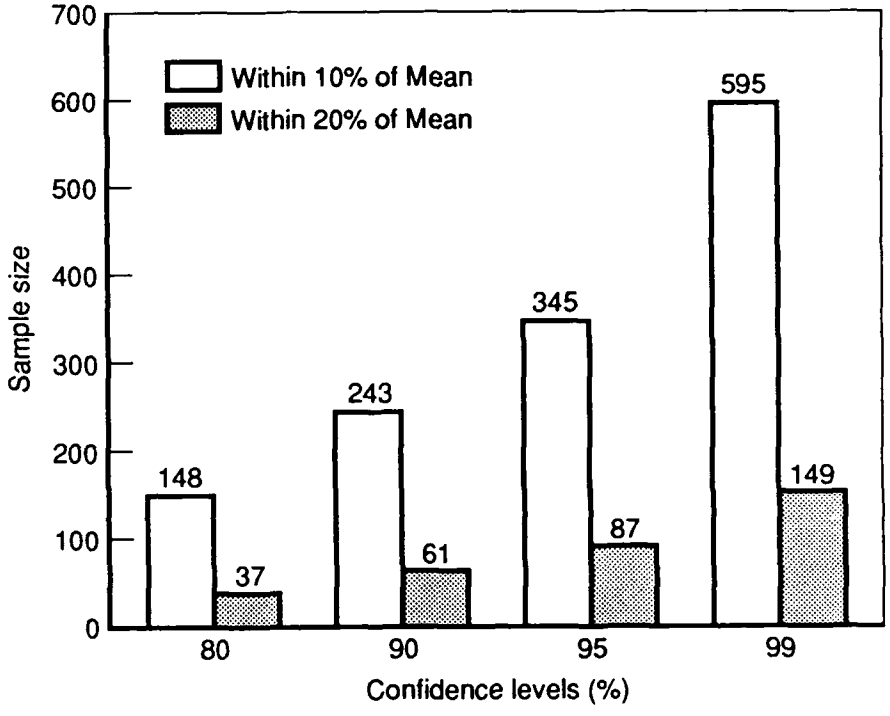

Fig. B.4—Minimum sample size per children's hospital based on median of hospital-specific estimates: outliers excluded

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